Government
Publications

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Ontario. Legislative assembly.
Sessional papers.

SESSIONAL PAPERS

VOLUME XL.—PART V.

Fourth Session of Eleventh Legislature

OF THE

PROVINCE OF ONTARIO

SESSION 1908

TORONTO:
Printed and Published by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1908.

WARWICK BRO'S & RUTTER, Limited, Printers
TORONTO.

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No. 3. . Report of the Minister of Lands, Forests and Mines of the Province for the year 1907. Presented to the Legislature 1st April, 1908. *Printed.*

No. 4. . Report of the Bureau of Mines for the year 1907. Presented to the Legislature, 1st April, 1908. *Printed.*

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No. 7. . Report of the Registrar General relating to the Registration of Births, Marriages and Deaths for the year 1906. Presented to the Legislature, 9th March, 1908. *Printed.*

No. 8. . Report of the Temiskaming and Northern Ontario Railway Commission for the year 1907. Presented to the Legislature, 21st February, 1908. *Printed.*

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No. 15.. Report of the Ontario Agricultural and Experimental Union of the Province, for the year 1907. Presented to the Legislature, 20th March, 1908. *Printed.*

No. 16.. Report of the Fruit Growers' Associations of the Province, for the year 1907. Presented to the Legislature, 2nd April, 1908. *Printed.*

No. 17.. Report of the Fruit Experimental Stations of the Province, for the year 1907. Presented to the Legislature, 2nd April, 1908. *Printed.*

No. 18.. Report of the Vegetable Growers' Association for the year 1907. Presented to the Legislature, 31st March, 1908. *Printed.*

No. 19.. Report of the Entomological Society, for the year 1907. Presented to the Legislature, 3rd March, 1908. *Printed.*

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No. 22.. Report of the Live Stock Associations of the Province, for the year 1907. Presented to the Legislature, 2nd April, 1908. *Printed.*

No. 23.. Report of the Poultry Institute of the Province, for the year 1907. Presented to the Legislature, 2nd April, 1908. *Printed.*

No. 24.. Report of Women's Institutes of the Province, for the year 1907. Presented to the Legislature, 23rd March, 1908. *Printed.*

No. 25.. Report of the Farmers' Institutes of the Province, for the year 1907. Presented to the Legislature, 23rd March, 1908. *Printed.*

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No, 28.. Report of the Bureau of Industries of the Province, for the year 1907. Presented to the Legislature, 2nd April, 1908. *Printed.*

No. 29.. Report of the Inspectors of Factories for the year 1907. Presented to the Legislature, 2nd April, 1908. *Printed.*

No. 30.. Report of the Bureau of Labour for the year 1907. Presented to the Legislature, 20th March, 1908. *Printed.*

No. 31.. Report on Highway Improvement for the year 1907. Presented to the Legislature, 21st February, 1908. *Printed.*

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No. 34.. Report upon the Archives of the Province, for the year 1907. Presented to the Legislature, 2nd April, 1908. *Printed.*

No. 35.. Report of Work relating to Neglected and Dependent Children of Ontario, for the year 1907. Presented to the Legislature, 16th March, 1908. *Printed.*

No. 36.. Report of the Provincial Board of Health, for the year 1907. Presented to the Legislature, 9th March, 1908. *Printed.*

No. 37.. Report of the Inspector of Division Courts, for the year 1907. Presented to the Legislature, 20th March, 1908. *Printed.*

No. 38. . Report of the Inspector of Legal Offices, for the year 1907. Presented to the Legislature, 12th March, 1908. *Printed.*

No. 39. . Report of the Inspector of Registry Offices, for the year 1907. Presented to the Legislature, 2nd April, 1908. *Printed.*

No. 40. . Report of the Secretary and Registrar of the Province, for the year 1907. Presented to the Legislature, 2nd April, 1908. *Printed.*

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No. 41. . Report upon the Hospitals for the Insane, Idiotic and Epileptic, of the Province, for the year ending 30th September, 1907. Presented to the Legislature, 31st March, 1908. *Printed.*

No. 42. . Report upon the Prisons and Reformatories of the Province, for the year ending 30th September, 1907. Presented to the Legislature, 31st March, 1908. *Printed.*

No. 43. . Report upon the Hospitals, Refuges and Charities of the Province, for the year ending 30th September, 1907. Presented to the Legislature, 21st February, 1908. *Printed.*

No. 44. . Report upon the Operation of Liquor License Acts, for the year 1907. Presented to the Legislature, 21st February, 1908. *Printed.*

No 45. . Report of the Provincial Municipal Auditor, for the year 1907. Presented to the Legislature, 21st February, 1908. *Printed.*

No. 46. . Supplementary Return from the Records of the several Elections in the Electoral Divisions of West York, Dufferin and Brockville, since the General Elections on January 25th, 1905, shewing: (1) The number of Votes Polled for each Candidate in the Electoral District in which there was a contest; (2) The majority whereby each successful Candidate was returned; (3) The total number of votes polled in each District; (4) The number of votes remaining unpolled; (5) The number of names on the Voters' Lists in each District. Presented to the Legislature, 6th February, 1908 *Printed.*

No. 47. . Report upon the state of the Library. Presented to the Legislature, 6th February, 1908. *Not printed.*

No. 48. . Report of the Hydro-Electric Power Commission of the Province, on the Cost of Power for the year 1907. Presented to the Legislature, 20th March, 1908. *Printed.*

No. 49. . Report upon Prison Labour. Presented to the Legislature, 5th February, 1908. *Printed.*

No. 50. . The Arbitration on the Unsettled Accounts, between the Dominion of Canada and the Provinces of Ontario and Quebec. Presented to the Legislature, 21st February, 1908. *Printed.*

No. 51. . Statement of Receipts and Disbursements of the Temiskaming and Northern Ontario Railway, on account of construction, for the year 1907. Presented to the Legislature, 21st February, 1908. *Printed.*

No. 52. . Report of the Commission on the Methods employed in the caring for and treating the Insane. Presented to the Legislature, 20th March, 1908. *Printed.*

No. 53. . Copies of Orders-in-Council and Regulations of the Department of Education. Presented to the Legislature, 11th February, 1908. *Not printed.*

No. 54. . Rules and Regulations under the Succession Duties Act, being 7 Edw. VII., cap. 10. Presented to the Legislature, 19th February, 1908. *Printed for distribution only.*

No. 55. . Copies of Orders in Council fixing fees payable to Surrogate Judges of County of Middlesex; amounts payable to Judges McTavish and Gunn out of the Surrogate Court fees, County of Carleton, and authorizing payment of surplus Surrogate fees, County of Grey, to His Honour, Judge Widdifield. Presented to the Legislature, 21st February, 1908. *Not printed.*

No. 56. . Return to an Order of the House of the Twenty-first day of February instant; for a Return, shewing list of Fair Associations to which expert Judges were sent by the Department of Agriculture during the past two years; the names of the Judges with copies of reports made to the Department from each local exhibition board. Presented to the Legislature, 25th February, 1908. Mr. *May. Not printed.*

No. 57. . Return to an Order of the House of the twenty-eighth day of February, for a Return, shewing—1. The Government call for tenders for the supply of flour required at the different Institutions of the Province for the year 1908. 2. How many tenders were received. 3. The names and addresses of the persons or firms tendering and the price *per* barrel of each tender delivered at the various Institutions. 4. To whom the tender was awarded. 5. The estimated quantity required at each Institution. Presented to the Legislature, 28th February, 1908. Mr. *McCoig. Not printed.*

No. 58. . Return to an Order of the House of the twenty-fourth day of February, 1908, for a Return, shewing—1 What are the estimated quantities of each class of work done to January 31st, 1908, on the Government Railway by McRae, McNeil & Chandler under their contract with the Temiskaming and N. O. Railway Commission. 2. What sums, with date of payment, have been paid to McRae, McNeil & Co., or their assigns, for such work. 3. Has the Government taken the work out of the hands of the contractors. 4. What security, if any, has the Government for the due performance of the contract by the said firm. Presented to the Legislature, 2nd March, 1908. Mr. *Smith (Sault Ste. Marie.) Not printed.*

No. 59.. Return to an Order of the House of the second day of March, 1908, for a Return, shewing—1. How many cases have been tried by both Drainage Referees since their appointment. 2. What expense was there in connection therewith over and above the Referee's Salary. Presented to the Legislature, 9th March, 1908. Mr. *McMillan*. *Not printed.*

No. 60.. Return to an Order of the House of the seventh day of February, 1907, for a Return, shewing—1. The number of Division Courts in the Province. 2. How many Division Court Clerks have resigned between the 7th February, 1905, and 1st February, 1907. 3. How many Division Court Clerks have been removed from office between the said dates. The names of such persons and the cause of removal. 4. How many Division Court Bailiffs have resigned between the 7th day of February, 1905, and the 1st day of February, 1907. 5. How many Division Court Bailiffs have been removed from office between said dates. The names of such persons and the cause of removal. Presented to the Legislature, 9th March, 1908. Mr. *Munro*. *Not printed.*

No. 61 . Return to an Order of the House of the ninth day of March, 1908, for a Return shewing—1. What Municipal Corporations applied to the Hydro-Electric Power Commission, under 6 Edw. VII., Chap. 15, Sect. 6, for the transmission of electric power or energy, with the respective dates of such applications. 2. Did the Commission give to each of the said corporations a statement of the terms and conditions upon which such electric power or energy would be transmitted and supplied by the Commission, together with a form of contract to be entered into between each of the said corporations and the Commission. 3. Did the Commission furnish to each of the said corporations any estimate of the cost of constructing, erecting, installing, and maintaining of buildings, works, plant, machinery, poles, wires, etc., necessary for transmitting and supplying to each said corporation the amount of power applied for. 4. If so, give names of corporations and amount of each respective estimate. 5. Names of municipalities in each of which a By-law was submitted under Section 7 of said Act. 6. Names of municipalities where such By-law received the assent of the electors. 7. Has any contract been finally entered into between the Commission and any such municipal corporation for the supply of electric power or energy by the Commission to such municipality. 8. (*a*) The names of municipal corporations, if any, that made application to the Commission under 7 Edw. VII., Chap. 19, Section 12, with the respective dates of such applications. (*b*) The maximum price *per* H. P. at point of delivery to Commission, quoted by Commission to each of said municipalities. 9. Between what Municipal Councils, if any, and the Commission was any provisional contract entered into as provided for by said Section 12, prior to the submitting of the By-law to the Electors by any such Municipal Council. 10. Has any such contract been finally executed under the provisions of Section 13 of said last mentioned Act. 11. Was any estimate given by the Commission to the several municipal corporations in accordance with the requirements of said Section 12, shewing

(*a*) The total cost of constructing and maintaining a transmission line or lines. (*b*) The proportion or amount of said total cost to be charged to and paid for by each municipality. 12 If so, the names of such municipalities and the amounts of such total cost to be charged to each of the said municipalities. 13. Were such estimates and provisional contracts published with the By-law, in accordance with the provisions of said section 12. Presented to the Legislature, 9th March, 1908. Mr. *MacKay*. *Not printed.*

No. 62.. Report upon the Feeble-minded in Ontario, with Census. Presented to the Legislature, 2nd April, 1908. *Printed.*

No. 63.. Return to an Order of the House of the third day of March, 1908, for a Return, of copies of all correspondence relating to the removal of what is known as the Wisa Wasa dam in Chisholm township in the District of Nipissing. Presented to the Legislature, 10th March, 1908. Mr. *Smith* (*Sault Ste. Marie*). *Not printed.*

No. 64 . Statement of distribution of Statutes, Revised and Sessional, for the year 1907. Presented to the Legislature, 10th March, 1908. *Not printed.*

No. 65.. Return to an Order of the House of the twenty-fourth day of February, 1908, for a Return, shewing—1. Any estimate made, prior to the doing of the work, of the cost of clearing along the sides of the right of way of the Temiskaming and N. O. Railway, through the Temagami Forest Reserve. 2. If so, by whom was such estimate made and what the amount thereof. 3. What has been the actual cost of this work to date. 4. What is the estimate, if any, of the annual cost of maintaining the clearing in such a way as to make it useful in preventing the spread of fire. Presented to the Legislature, 10th March, 1908. Mr. *Smith* (*Sault Ste. Marie.*) *Not printed.*

No. 66.. Return to an Order of the House of the fifth day of March 1908, for a Return, shewing what timber located on the right of way of the Temiskaming and N. O. Railway has been put up for sale during the last two years, by tender or otherwise, by the Temiskaming and N. O. Railway Commission. Also, what prices have been obtained and the time and manner of payment; the names of the purchasers and copies of the tenders sent in by them, and also copies of all tenders received in the case of each berth sold. Presented to the Legislature, 17th March, 1908. Mr. *May*. *Not printed.*

No. 67.. Return to an Order of the House of the twenty-sixth day of February, 1908, for a Return, shewing the quantities of timber cut under license in the Township of Freeman by Arthur Hill, or any assignee, or assignees, of the license formerly held by the said Hill in the said Township; shewing in each year the person, or persons, who scaled logs on behalf of the Government on said limit, and in each year the quantity scaled by each of the said Government scalers, if more than one employed. Also, the names of the persons and quantities of logs in each year scaled by the

Culler or Cullers of the said Arthur Hill, or any assignee of the said license of the said Hill, also, shewing the assignee, or assignees, of the said Hill. Presented to the Legislature, 17th March, 1908. Mr. *Duff.* *Not printed.*

No. 68. . Return to an Order of the House of the thirteenth day of March, 1908, for a Return, shewing the amount expended on Colonization Roads in the District of Manitoulin, during the years 1902, 1903, 1904, 1905, 1906 and 1907, respectively. Presented to the Legislature, 18th March, 1908. Mr. *Smith* (*Sault Ste. Marie.*) *Not printed.*

No. 69. . Return to an Order of the House of the thirteenth day of March, 1908, for a Return, shewing the number of Bridges built, by the present Government, on the Spanish and Sauble Rivers, shewing where the Bridges cross the rivers and the appropriation made for each. Presented to the Legislature, 18th March, 1908. Mr. *Smith (Sault Ste. Marie).* *Not printed.*

No. 70. . Return to an Address to His Honour the Lieutenant-Governor, of the twenty-first day of February, 1908, praying that he will cause to be laid before this House, a Return, shewing the several Commissions, both special or permanent, issued by the present Government; the object or purpose of each Commission; the cost to the Province of each, up to the end of the year 1907, together with the names, in each case, of the several Commissioners. Presented to the Legislature, 23rd March, 1908. Mr. *May.* *Not printed*

No. 71. . Return to an Address to His Honour the Lieutenant-Governor, of the twenty-fourth day of February, 1908, praying that he will cause to be laid before this House, a Return, shewing the several Commissions of all descriptions issued during the years 1902, 1903 and 1904, the purpose of each Commission, the cost to the Province, together with the names of the several Commissioners in each case. Presented to the Legislature, 23rd March, 1908. Mr. *Preston* (*Lanark.*) *Not printed.*

No. 72. . Return to an Order of the House of the 21st day of February, 1908, for a Return, shewing: 1. The amount of losses caused by fire, in the Province, during the years 1900 to 1907, both inclusive—as reported to the Department of Insurance. 2. The amount of such losses reported to have been caused by incendiarism. 3. The amount of such losses caused by lightning. Presented to the Legislature, 24th March, 1908. Mr. *Munro.* *Not printed.*

No. 73 . A Return to an Order of the House of the twenty-sixth day of February, 1908, for a Return, shewing—1. How many civil servants have been dismissed since advent of present Government. 2. How many have resigned. 3. How many vacancies created by any other cause. 4. How many appointments to the Civil Service have been made during said period. 5. What was the number of civil servants in the employ of the Government on

December 31st, 1904. 6. What is the present number. Presented to the Legislature, 2nd April, 1908. Mr. *Ross. Not printed.*

No. 74. . A Return to an Address to His Honour the Lieutenant-Governor, of the fifth day of March, 1908, praying that he will cause to be laid before this House, a Return, of copies of all correspondence with the Government, or any member thereof, relating to the removal of Thomas Woodyatt from the office of Police Magistrate of the City of Brantford, also, copy of Report of Commissioner appointed to investigate certain charges preferred against said Woodyatt, and statement of aggregate cost of said Commission. Presented to the Legislature, 2nd April, 1908. Mr. *Preston (Brant.) Not printed.*

No. 75. . Return to an Order of the House of the eighteenth day of March, 1908, for a Return shewing: 1. How many persons have received permanent professional certificates under authority of either Sections 2, 3, or 4, of Chapter 52 of the Statutes of Ontario, passed in 1907. 2. Their names. 3. Under which Section they have qualified, and 4. How many persons have notified the Minister of Education, in writing, of their intention to comply with the provisions of either Section 6, or Section 7, of Chapter 52 of the Statutes of Ontario, passed in 1907. 5. What were the names and addresses of those who applied under each Section. Presented to the Legislature, 2nd April, 1908. Mr. *McElroy. Not printed*

No. 76. . Handbook of the Province. Presented to the Legislature, 2nd April, 1908. *Printed for distribution only.*

No. 77. . Return to an Address to His Honour the Lieutenant-Governor, of the ninth day of March, 1906, praying that he will cause to be laid before this House, a Return of copies of all papers and correspondence regarding the settlement of the Indian Claim of Northern Ontario, known as Treaty No. 9, together with a copy of the Treaty as finally agreed upon. Presented to the Legislature, 6th April, 1906. Mr. *Ross. Printed.*

No. 78. . Return to an Order of the House of the twenty-first day of February, 1908, for a Return, shewing a classified statement of annual payments of all kinds made by the Province to the University of Toronto and the School of Practical Science, for salaries, erection of buildings, maintenance, or for any other purpose whatever, for and during the period of the past six years. Presented to the Legislature, 10th April, 1908. Mr. *Hislop. Printed.*

UNIVERSITY OF TORONTO

REPORT OF THE

BOARD OF GOVERNORS

FOR THE YEAR

ENDING 30th JUNE, 1907

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO.

TORONTO:
Printed and Published by L. K. CAMERON, Printer to the King's Most Excellent Majesty.
1907.

WARWICK BRO'S & RUTTER, Limited, Printers
TORONTO.

UNIVERSITY OF TORONTO.

REPORT OF THE

BOARD OF GOVERNORS

FOR THE YEAR ENDING JUNE 30TH, 1907.

To His Honour The Lieutenant-Governor-in-Council:

The Governors of the University of Toronto beg leave, in accordance with the provisions of the University Act, 1906, to submit the annual report of their transactions for the year ended 30th June, 1907.

In accordance with the recommendations of the Commissioners appointed by Your Honour in Council on the 3rd October, 1905, the University Act, 1906, was passed, which transferred to the Governors the powers formerly vested in the Executive Government, and gave them the government, conduct, management and control of the University and University College and of their property, revenue, business and affairs, including the appointment of the President and all other officers of the University and College.

Shortly after their organization, owing to the resignation of Dr. Loudon, the Governors were called upon to select a President of the University; and on the 30th June, 1906, a Committee was appointed to make enquiry and report to them the names of persons available for the position of President.

Under the direction of this Committee its Chairman addressed letters to Heads of Universities and others in Great Britain, the United States and Canada, with the view of obtaining the following information: 1st, the names of as many gentlemen as possible who seemed to be eligible for the position; 2nd, the names of all Canadians holding University appointments outside of Canada. The number of letters written by the Chairman was 119, and the number of letters received was 86. Among the latter were many communications affording valuable information, but not written in response to enquiries. This correspondence necessarily occupied a considerable period of time; but when the Committee felt that they had in their possession substantially all the information they could obtain, they dealt with the matter by considering (1) the occupants of academic positions in the various Universities in Canada, including the Faculty of the University of Toronto, (2) the occupants of academic positions in the United States who are Canadians by birth, and who were educated at least partially in Canada, and (3) the

name of every person, of whatever nationality, who had been suggested as eligible, either in response to enquiries or by communications received from other sources.

Upon the report of the Committee the Governors on the 14th of June, 1907, appointed to the Presidency, Robert Alexander Falconer, D. Litt., LL.D.

Owing to the delay which the search for a President involved, it became necessary to appoint a President *pro tempore*, and Dr. Hutton, the Principal of University College, was appointed to that office, the duties of which he discharged in a most satisfactory manner.

Although the active duties of Dr. Loudon in connection with the University terminated very soon after the Governors entered upon their office, they may be permitted to say that they recognize the service which Dr. Loudon rendered over a long period of years. As teacher and organizer he brought the Department of Physics to a high standard of efficiency, and as President he was thoroughly conversant with the conditions of the University, and spent himself unreservedly in promoting its welfare during a very trying period.

Of the revenue of the University, which for the year amounted to $456,398: $47,459 was the income from endowment, $184,211 was received from fees of students, and $224,728 represents the amount received from the Province.

Though there is a large income from fees which will increase, should the attendance of students continue to grow in the proportion of the past few years, the revenue from that source will not provide for the increasing and varied educational needs of the University and University College. It was recognized by the Royal Commissioners that in addition to the income from the endowment and from the fees of students the revenue must be largely supplemented by aid from the Provincial Exchequer and "some means of fixing this income upon a definite basis should be found;" and as, in their opinion, the Succession Duties formed a source of Provincial revenue which might be reasonably expected to grow in some relation to the expansion of the University and College, it was recommended that these duties should be adopted as the means of fixing the income upon such a basis as the Commissioners deemed essential.

The recommendations of the Commissioners were approved by Your Honour and adopted by the Legislature, and the conclusion having been reached that a supplementary income from the Provincial Exchequer of $250,000 was required to meet the expenditures for the first academic year, and 50 per cent of the average yearly gross receipts of the Province from Succession Duties, determined by and based upon the gross receipts of the preceding three years, being the proportion required to provide that sum, that percentage was adopted as the basis upon which the anual grant for the maintenance of the University and College should be determined. But to guard against the contingency of the stated percentage affording a greater income than should be found necessary, provision was made in the University Act of 1906 that if in any year the amount payable to the Governors on that basis should exceed the amount of the estimated expenditure for the maintenance and support of the University and College for that year, Your Honour might direct that the excess should be (a) added to the permanent endowment, or (b) set apart as a contingent fund to provide against a deficiency in any future year, or (c) applied in expenditures on capital account,

or that (d) the amount payable should be reduced to the sum actually required.

It is in the judgment of the Governors essential, if the University and College are to develop so as to keep pace with the growth in population, wealth and importance of the Province, and to meet its ever increasing educational needs, that those entrusted with the important duty resting upon the Governors should be in a position not only to provide for the present but to plan for the future; and in order that they may do this economically as well as efficiently the revenue at their disposal, as the Royal Commissioners pointed out, should be fixed upon a definite basis.

In at least eight States of the neighboring Republic this has been recognized, and provision is made for the maintenance of the State University by a fixed tax upon the assessed value of all property in the State, the proceeds of which are paid over to and administered by the governing body of the University.

By the University Act of 1906, the Governors are required annually to report their transactions to Your Honour-in-Council, setting forth in detail the receipts and expenditures of the preceding year and the investments as they stood at the end of the year, with such other particulars as Your Honour may require, and it is further provided that their accounts are to be audited at least once a year by the Provincial Auditor or by some person appointed by Your Honour for that purpose.

The expenditure for maintenance, as will be seen from the accompanying statements, was $411,696, exclusive of $44,701 which was applied towards repaying the amount withdrawn from the endowment fund for the completion of the Physics Building under the authority of an Order-in-Council by the terms of which the amount withdrawn was required to be repaid out of income.

The expenditure apparently exceeded that of the preceding year by $111,066, but in making a comparison of the expenditures of the two years it must be remembered that in the year 1906-7 the Faculty of Applied Science and Engineering for the first time became a department of the University, and that it was previously maintained directly by the Province. The amount expended in that Faculty during the half year from January to June, 1907, $53,547, must therefore be deducted from the $111,066, making the actual increase of the past year $57,519. Of this increase $50,310 was expended in the Faculty of Arts, including under that head the cost of administration of the University and College: $4,850 represents the increase in cost of the Faculty of Household Science due to the completion of the teaching staff; and $1,375 and $875 respectively represent the initial expenditures upon the new Faculties of Education and Forestry.

Reference may be made to some of the items of this increase in the Faculty of Arts.

The amount charged to the President's Office exceeded that of the previous year by $1,051, much of which consisted of small grants to members of the teaching staff to assist in defraying their expenses in visiting annual meetings of learned Societies.

There was also an increase of $1,296 in insurance (included in the cost of administration) owing mainly to the insurance of the buildings of the former School of Practical Science, the Convocation Hall and the new Physics Building.

Another item of increase was $5,520 spent on examinations, due to the larger number of students in every department, to the addition of the Faculty of Applied Science and Engineering, and to changes in the method of examination in the Medical Faculty.

On the Library there was spent $2,731 more than in the previous year, which was devoted almost altogether to the purchase of new books; and the $2,718 for the Museum was expended in collecting part of the valuable archæological material lately on exhibition in the University.

The increase of $2,820 in the Department of Biology was due partly to the cost of remodelling for additional accommodation and partly to expenditure on the equipment of the departmental museum.

A few words of explanation should be given for the additional $1,544 expended in carrying on the work of the Summer Session. So far the Summer Session is tentative. It aims at providing instruction in the subjects of the first two years of the Arts course chiefly for teachers and others who may be unable to attend the classes during the winter. It is too soon to pronounce upon the probability of its future growth and development, though the experience of other Universities justifies the hope that in connection with extension work it may become a department of the University which will serve the Province very effectively.

The Memorial Volume, setting forth the history of the University up to the time of its reorganization under the Act of 1906, cost $2,603; and the increase of $4,000 under Pensions and Gratuities was due to the allowance of $5,500 per annum made to Dr. Loudon on his retirement from the Presidency.

The largest item of increase, $25,925, was due to expenditures for salaries. This increased expenditure is partly referable to the larger number of students in attendance, which has required the addition of many new lecturers and assistants, partly to the annual increase in the salaries to which the members of the teaching staff were entitled, and partly to an increase of ten per cent. which was made in their salaries and which became operative during the latter half of the year.

The necessity of a revision of the salaries has long been manifest, but before the Act of 1906 it was impossible of accomplishment owing to the straitened financial circumstances of the University. The subject was dealt with by the Royal Commissioners, who recommended that "the general scale of salary for Professors and other members of the teaching staff should be reconsidered" and pointed out that "it was adopted many years ago when the cost of living was much less and when the rate of remuneration fixed bore a fair proportion to the salaries of persons in other walks of life" and that "the multiplication of pursuits in which men of learning and scientific attainments can earn large incomes has enhanced the difficulty of securing the best men for university teachers."

The Governors, recognizing that to enable them to carry out this recommendation was one of the purposes of the increased grant placed at their disposal by the Legislature, have under consideration and hope to have completed before the close of the calendar year a full revision of the salaries and thus remove an injustice from which the teaching staff have long been suffering. The increase of ten percent. which has been referred to was a temporary measure designed to bridge over the period while the general revision was under consideration, a question requiring for its satisfactory solution time for full enquiry and mature deliberation.

Though the expenditure is large and increasing the number of students during the last ten years has rapidly increased, as will be seen from the following table :

STUDENTS 1897-8—1906-7.

	1897–8	1898–9	1899–00	1900–1	1901–2	1902–3	1903–4	1904–5	1905–6	1906–7
Faculty of Arts:										
University	.....	.....	.....	.....	.....	.....	8	59	191	95
University College	.....	.....	.....	.....	623	589	619	653	712	826
Victoria College	.....	.....	.....	.....	239	271	256	300	349	380
	923	870	762	763	862	860	883	1,012	1,252	1,301
Trinity College	.....	.....	.....	.....	.....	.....	.....	.....	114	113
Graduate	.....	.....	.....	.....	.....	.....	.....	.....	.....	78
Summer Session	.....	.....	.....	.....	.....	.....	.....	.....	.....	55
Teachers' Course	.....	.....	.....	.....	.....	.....	.....	.....	.....	37
Faculty of Medicine	295	306	308	313	394	474	494	721	648	723
Faculty of AppliedScience	135	146	156	193	231	290	340	402	533	627
Faculty of Household Science	.....	.....	.....	.....	.....	.....	.....	.....	.....	104
	1,353	1,322	1,226	1,269	1,487	1,624	1,717	2,135	2,547	3,038

An analysis of the localities from which the students came during the year 1906-7 may be of interest.

Toronto	934	
Elsewhere in Ontario	1,859	
		2,793
Quebec		15
New Brunswick		6
Nova Scotia		2
Prince Edward Island		11
Manitoba		27
Saskatchewan		25
Alberta		26
British Columbia		45
Yukon Territory		1
Newfoundland		5
England		1
United States		28
Foreign		53
		3,038

It is thus obvious that the University is serving the Province most effectively, inasmuch as it draws from Ontario so many of its students; while at the same time the attendance from every Province of the Dominion gives the University a national importance. The University of Toronto has taken rank as one of the leading Universities of the Empire, and one of the largest on this Continent. It must provide for the people of Ontario at the cheapest possible cost the highest attainable standard of education in Arts and in the various courses leading to scientific and other professions.

It may be well to point out and to emphasize the fact that if they are to keep pace with the educational needs of the Province and the increase in the number of students the University and College must face the necessity of constantly adding to the number of their teachers.

The new scientific departments in the Faculty of Arts and the professional Faculties of Medicine and Applied Science, as at present organized, require expensive and constantly increasing outlay for their adequate equipment, and the future development of the Province as it advances more and more on scientific lines will demand the addition of new departments.

In the Faculty of Medicine, on account of the method of remuneration of the teaching staff which has hitherto prevailed, the increase in the number of students has not involved a corresponding increase in cost, but renewed and increasing expenditure may be looked for in the future, if the people of this Province are to have the opportunity of being served by a medical profession which has been trained in the most thorough scientific methods in laboratories with the best possible equipment and by teachers of recognized attainments.

A very thorough course of training is offered in the Faculty of Household Science and has been taken advantage of by many. In this department an opportunity is offered for acquiring the knowledge which will enable the student to earn a livelihood in a branch of teaching hitherto not ordinarily followed by women. The standard is both scientific and practically useful in preparing students for the duties of domestic economy.

The Faculty of Education, the establishment of which was recommended by the Royal Commissioners, is another very important development in the last University year. In this Faculty work that was formerly done in the Ontario Normal College at Hamilton is undertaken and developed, and it affords an opportunity for connecting the University with the Public School system, so that the University may help the Schools and the Schools may be brought into touch with the University by the recognition that the University is most deeply interested in their progress. The present accommodation for this Faculty is inadequate. Arrangements have been made with the Board of Education of Toronto for the temporary use of their schools for observation and practice teaching, pending the erection and equipment for these purposes of new buildings which have been arranged for but probably will not be completed for two years.

The establishment of the Faculty of Forestry, also recommended by the Royal Commissioners, the Governors feel will commend itself to the Province inasmuch as the value of the forests has assumed great proportions Nothing could accentuate more the gravity of the situation in regard to the timber supplies of the future than the late utterances, in his message to Congress, of the President of the United States regarding the plight of the paper manufacturers, in which attention is called to the importance of Canada's forest resources. The need is urgent of husbanding these resources, of developing this potential wealth, and of training our young men in that important branch of science in order that by their knowledge and skill they may help to perform a similar service to that rendered so signally to the farming community by the Ontario Agricultural College. The Faculty of Forestry will also be of direct advantage to the farmers by developing, in co-operation with the Agricultural College, the best methods of recovering waste lands with forest growth; by educating men who can give technical advice in this work; and by furnishing information through lectures and printed matter.

The chief building operations of the year have been the partial com-

pletion of the Convocation Hall, which was formally opened in June, and of the new Physics Building which, though not fully completed, was opened in October, 1907. An examination hall to form part of the Convocation Hall building is now in course of construction, and the Governors hope that in the near future they may be in a position to complete the building according to the design which has thus far been only partially carried out. The Convocation Hall is one of the finest University halls to be found anywhere, and in addition to serving for convocations it is of great importance in enabling the students of the various faculties to meet together in academic functions, and so to promote a common University spirit which becomes more and more a necessity in a large University where there are so many different interests.

In the near future the University must look to a large increase in outlay for buildings. The rapidly growing Faculty of Applied Science and Engineering already requires additions for the housing of its students and for the development of new departments. In the Medical Faculty there is also overcrowding, especially in the Anatomical department, and provision must soon be made to meet it. With the new Faculties of Education and Forestry and the largely increased number of students in Arts the main building is overcrowded. The condition of the Library building has been such that steps were taken last year to consider how best it might be enlarged. The Librarian's report on the subject is at present under consideration, and the work must shortly be undertaken.

Another extension is urgent, occasioned by the development of the botanical department of the University, especially in connection with the Faculty of Forestry, which will require very soon the building of plant houses and the laying out of a botanical garden, for the initial expenditure in connection with which a sum was included in the aid given by the Act of 1905.

It is therefore evident that even with the most rigid economy the necessities of the rapidly growing University and College demand a very large and constantly increasing outlay, and the Governors confidently believe that in a Province with such an intelligent population and so great natural resources as Ontario possesses the reasonable requirements of the Governors to meet that outlay will as in the past be promptly and adequately provided for by the Legislature with the approval of the people.

The Royal Commissioners recommended the building of a properly equipped museum as one of the necessary features of a great modern University. The wisdom of using such a museum as the means not only of exhibiting the archæology, ethnology, natural history and resources of our own country, but also of placing before the people of the Province objects of similar interest gathered in other parts of the world, is manifest. The University already possesses valuable teaching museums in connection with several branches of study, and the building of a general museum, accessible to the public, will not interfere with these; but will afford room for them and for the large and valuable ethnological, anthropological and other collections which cannot be exhibited under present conditions. There is also under the control of the Education Department the Provincial Museum, in which a remarkable collection in North American and other archæology is exhibited, and the Governors believe it to be very desirable that the collection should be conveniently available for University students, as well as the general public. The Governors hope to be able to present reasons to Your Honour's advisers which will result in bringing all this

valuable material together in one museum. A site for the new museum has been set apart and the plans are now being developed by the Architects and the Committee in charge of the matter.

It may be well to add a few words regarding the more notable material either awaiting suitable exhibition or, as in many cases, not now being exhibited or made use of in any manner. There are the extensive collections made during the past five years by Mr. C. T. Currelly. These are particularly rich in palæolithic implements of the old world ; in archæological and other evidences of the ancient civilizations of Egypt and adjacent countries; and in medieval armor, ceramics and tapestries. A very small portion of these collections was recently exhibited and excited great interest. Victoria College, under whose encouragement Mr. Currelly's first work was done, has much valuable material gathered by missionaries and others which will find a home in the museum. The University has large and most important mineralogical collections which should be accessible to the public. The palæontological collection beginning with the gift of Mr. B. E. Walker, enlarged by the purchase through the liberality of Mr. William Mackenzie of the unique collection of Cambrian material made by Dr. G. F. Matthew of St. John, N.B., and since largely added to by purchase and by extensive collection in Canadian areas, is now most inadequately housed in space badly needed by the Faculty of Applied Science. In the Biological museum there is doubtless much material which might with advantage be transferred to the general museum, and there are many departments of science, especially in the direction of natural history, which have been neglected because museum space is an essential requirement to the collecting of material.

It may be fitting here to refer to recent benefactions to the University. Notable among these are the three handsome residences for men students now in course of construction by the University Residence Trustees upon land set apart for the purpose within the University grounds. Of these buildings, which are designed to accommodate about one hundred and fifty students, one is solely due to the munificence of Mr. E. C. Whitney and Mrs. Whitney, another is being erected by some friends of the University, and the third with funds provided for the purpose by the University Act of 1905. It is confidently expected by the Trustees that these residences will be the beginning of a series of similar buildings contributed by private benefaction which will meet the great need of the University in this most important feature of undergraduate life.

Special mention deserves also to be made of the public-spirited generosity of Mrs. Massey-Treble in offering to provide the building for the Household Science Department. Plans for this structure are now in preparation and a site has been set aside for its erection on the University grounds at the south-east corner of Bloor Street and Avenue Road.

During the year the following properties were acquired by purchase: —

(1) No. 69 St. George Street, 90 x 198 feet. The residence has since been put into a satisfactory state of repair and is rented to the President and occupied by him. (2) The properties heretofore used by St. Margaret's College, consisting of the entire frontage on the south side of Bloor Street between Spadina Avenue and Huron Street, 462 ft. by a frontage on Huron Street of 189 feet 5 inches, and a maximum depth from Bloor Street in the centre of the block of 258 feet. On this property the buildings for the use of the Faculty of Education are to be erected. (3) The vacant lot west of the City Technical School on the south side of College Street, 142 x 265 feet, which will probably be needed in the near future for University extension.

The following appointments and promotions, not including sessional ones, have been made during the year:—

Faculty of Arts.

Physics:

J. C. McLennan, promoted from Associate Professor to Professor.
E. F. Burton, Demonstrator.
L. Gilchrist, Demonstrator.

Geology and Mineralogy:

A. L. Parsons, Lecturer (Mineralogy).

Chemistry:

F. B. Kenrick, promoted from Lecturer to Associate Professor.

Biology:

B. A. Bensley, promoted from Lecturer to Associate Professor of Zoology.
E. M. Walker, Lecturer, Zoology.
R. B. Thomson, Lecturer, Botany.

Comparative Philology:

A. J. Bell, Professor.

Italian and Spanish:

F. J. A. Davidson, promoted from Lecturer to Associate Professor.
M. A. Buchanan, Lecturer.

Philosophy:

F. Tracy, promoted from Lecturer to Associate Professor.
W. G. Smith, Lecturer and Laboratory Assistant.
T. R. Robinson, Lecturer.

Latin:

G. Oswald Smith, Lecturer.

French:

St. Elme de Champ, promoted from Instructor to Lecturer.

German:

P. Toews, promoted from Instructor to Lecturer.

Oriental Languages:

R. Davidson, promoted from Lecturer to Associate Professor.

Faculty of Medicine.

Anatomy:

J. P. McMurrich, Professor.

Pharmacy and Pharmacology:

V. E. Henderson, Lecturer.

FACULTY OF APPLIED SCIENCE.

Chemistry:

E. G. R. Ardagh, promoted from Demonstrator to Lecturer in Applied Chemistry.
J. W. Bain, promoted from Lecturer to Associate Professor of Analytical Chemistry.
M. C. Boswell, promoted from Demonstrator to Lecturer in Organic Chemistry.

Surveying:

W. M. Treadgold, Lecturer.
S. R. Crerar, promoted from Fellow to Demonstrator.

Mining:

E. Wade, Demonstrator.

Applied Mechanics:

J. McGowan, promoted from Lecturer to Associate Professor.

Hydraulics:

J. J. Traill, promoted from Fellow to Demonstrator.

FACULTY OF HOUSEHOLD SCIENCE.

Miss A. L. Laird, Associate Professor of Household Science.
Miss C. C. Benson, Associate Professor of Physiological Chemistry.

FACULTY OF EDUCATION.

W. Pakenham, Dean of the Faculty and Professor of the History and Science of Education.
H. T. J. Coleman, Associate Professor of Education.

FACULTY OF FORESTRY.

B. E. Fernow, Dean of the Faculty and Professor of Forestry.

MISCELLANEOUS.

R. A. Falconer, President.
C. T. Currelly, Curator of Oriental Archæology.
J. W. Barton, Physical Director at the Gymnasium.

Accompanying this report is a statement in detail of the receipts and expenditures for the year, and of the investments as they stood at the end of the year, which have been audited by Mr. W. H. Cross, F.C.A., the auditor appointed by Your Honour under the provisions of the University Act, 1906.

JOHN HOSKIN,
Chairman.

Toronto, 19 December, 1907.

AUDITOR'S REPORT.

TORONTO, October 1st, 1907.

To the Governors of the University of Toronto:

Gentlemen,—I beg to present the Financial Statement of the University for the fiscal year ending 30th June, 1907, and to report that I have completed the audit of all transactions on Revenue and upon Capital accounts for that year.

I have also verified all the accounts of assets and funds as summarized in the Balance Sheet.

The form followed in the preparation of the statement has been, as nearly as changed conditions permit, that of the returns for previous years.

Yours faithfully,

W. H. CROSS,
Auditor.

APPENDIX 1.

Balance Sheet 30 June, 1907.

Funds.

General Endowments Fund	Schedule 1	$3,171,733 09
Specific Endowment Funds	" 2	86,570 48
Retirement Fund	" 3	111,445 23
Trust Funds	" 4*a*	16,796 51
Equipment Funds	" 4*b*	451,972 15
Revenue Outstandings	" 5	49,289 48
		$3,887,806 94

Assets.

Site Lands, Buildings and Contents	Schedule 6	$2,344,662 10
Unproductive lands	" 7	70,126 80
Leased properties	" 8	676,743 66
Investments and cash	" 9	794,485 00
University Press	Appendix IV	1,789 38
		$3,887,806 94

Schedule 1.

General Endowments Fund.

Fund of 30 June, 1906	$3,357,162 09	
Less University Press entry reversed	1,073 43	
		$3,356,088 66
Sale of gore residue of lot 15, con. 12, Township of Seymour (south of River)		200 00
Women's Residence, Queen's Hall, further construction outlays during 1906-7		716 00
Library, 1906-7 additions:		
Books added as per Accession Catalogue	$7,070 12	
Less 3% upon $143,628.20 for the year's depreciation.	4,308 84	
		2,761 28
		$3,359,765 94

Contra.

Convocation Hall, Construction outlays:		
Authorised under sec. 6, cap. 37 of 5 Edw. VII., to be made directly from Endowment	$60,000 00	
Less receipts during 1906-7 from Sales of Wild lands, being a first instalment in restoration to Endowment of this advance	2,265 46	
		57,734 54
Physics Building, Construction:		
Advance from Endowment authorised by Order-in-Council dated 21 September, 1906	$125,000 00	
Less restoration to Fund from Revenue of 1906-7 as portion of repayment provided for in said Order-in-Council	44,701 69	
		80,298 31
Toronto General Hospital:		
Payment to Trustees authorised by Sec. 5 of above Act to be made directly from Endowment		50,000 00
		$188,032 85
Fund of 30 June, 1907		$3,171,733 09

SCHEDULE 2.

Scholarship Trust Funds.

Blake Matriculation	$25,339 70	
Blake, Science and Moderns	3,750 00	
Moss, Classics	2,000 00	
William Mulock, Classics and Mathematics	2,000 00	
Daniel Wilson, Natural Science	2,000 00	
George Brown, Modern Languages	1,128 34	
George Brown, Medical Science	5,391 72	
Mary Mulock, Classics	2,838 74	
William Ramsay, Political Economy	1,009 42	
Julius Rossin, German	1,000 00	
Bankers, Political Science	1,200 00	
John Macdonald, Philosophy	2,030 00	
Physics, A. A. A. S. Scholarship	2,350 00	
Prince of Wales, General Proficiency	950 00	
Mackenzie Memorial	18,709 60	
Fulton Bequest	3,291 30	
Star Bequest	5,279 60	
Lyle Medal	281 02	
Young Memorial	3,306 04	
Gibson, Matriculation	2,100 00	
Board of Trade, Commercial	100 00	
Reeve Scholarship	500 00	
French Prose Prize	15 00	
		$86,570 48
Return of 30 June, 1906	$85,267 96	
Interest appropriation	4,277 52	
Rent, Starr Farm	120 00	
Gibson Matriculation	100 00	
French Prose Prize	15 00	
Reeve Scholarship	250 00	
		$90,030 48
Scholarship Expenditures		3,460 00
		$86,570 48

SCHEDULE 3.

Retirement Fund, Beneficiaries, 30 June, 1907.

Maurice Hutton	$7,303 25
R. Ramsay Wright	7,303 25
W. J. Alexander	7,303 25
Alfred Baker	7,303 25
J. G. Hume	6,951 52
J. F. McCurdy	6,084 85
James Mavor	5,753 09
G. M. Wrong	4,922 50
A. B. Macallum	4,337 33
W. H. Fraser	4,099 00
John Squair	4,099 00
John Fletcher	4,046 19
W. J. Loudon	2,875 03
D. R. Keys	2,875 03
H. H. Langton	2,815 62
August Kirschmann	2,491 40
W. Lash Miller	2,353 04
W. R. Lang	2,282 82
W. S. Milner	2,221 63
J. H. Cameron	2,221 63
G. H. Needler	2,177 19
A. T. DeLury	2,022 93
Adam Carruthers	1,949 35
James Brebner	1,948 90
C. A. Chant	1,915 05

SCHEDULE 3.—*Continued.*

J. C. McLennan	$1,619 86	
T. L. Walker	1,440 93	
G. W. Johnston	1,200 50	
P. Toews	746 18	
F. Tracy	694 38	
F. B. Kenrick	580 10	
F. B. Allan	572 60	
B. A. Bensley	504 06	
F. A. Mouré	476 64	
W. H. Piersol	367 50	
J. H. Faull	364 77	
A. H. Abbott	327 46	
F. J. A. Davidson	288 30	
J. C. Fields	261 01	
E. J. Kylie	257 77	
W. A. Parks	240 25	
S. J. McLean	226 51	
M. W. Wallace	206 33	
Henry Montgomery	182 70	
St. E. DeChamp	162 85	
M. A. Mackenzie	152 25	
R. Davidson	111 65	
Wm. Pakenham	90 00	
E. F. Burton	88 81	
T. Eakin	88 81	
B. E. Fernow	86 25	
L. Gilchrist	65 97	
W. G. Smith	65 97	
M. A. Buchanan	65 00	
R. B. Thomson	58 36	
V. E. Henderson	57 40	
T. R. Robinson	50 75	
E. M. Walker	50 75	
A. L. Parsons	36 46	
		$111,445 23
Fund of 30th June, 1906	$106,593 76	
Contributions 1906-7	8,985 72	
Interest as per terms of Order-in-Council	6,079 70	
	$121,659 18	
Withdrawal, James Loudon	10,213 95	
		$111,445 23

SCHEDULE 4*a*.

Trust Accounts.

Library Funds:		
King Alfred Millenary Fund	$10,745 62	
Phillips Stewart bequest	1,526 68	
Residence Extension Fund	1,113 36	
John Langton Memorial	30 00	
Sir William Mulock	746 40	
Mulock Portrait Fund	7 89	
Alumnae Prize, English	10 00	
University Studies	61 70	
Women's Residence	1,826 19	
Physical Laboratory—Radium Fund	70 78	
Rifle Association	102 25	
Moss Portrait Fund	82 50	
Sir Daniel Wilson Portrait Fund	473 14	
		$16,796 51
Return of 30 June, 1906	$18,722 91	
Receipts:		
Interest appropriations	514 14	
Women's Residence Housekeeping account	8,255 90	
Women's Residence Fund	28 00	

SCHEDULE 4a.—*Continued.*

University Studies	$2,065 85	
Moss Portrait Fund	619 00	
Sir Daniel Wilson Portrait Fund	473 14	
Library Restoration	100 00	
Alumnae Prize	10 00	
		$30,788 94
Expenditures:		
Library Insurance Fund	$2,027 33	
Library Restoration Fund	100 00	
Library Medical Fund	46 95	
King Alfred Millenary Fund	367 75	
Phillips Stewart Bequest	51 23	
University Studies	2,993 83	
Women's Residence Housekeeping Account	7,630 21	
Moss Portrait Fund	536 50	
Rifle Association	207 75	
Wallbridge Bequest	20 88	
Alumnae Prize	10 00	
		$13,992 43
		$16,796 51

SCHEDULE 4b.

Equipment Funds.

Realized from 30 yearly accruing annuity payments of $30,000 each granted under provisions of Cap. 37 of 5 Edw. VII		$579,384 21
Appropriations therefrom.		
Women's Residence:		
Construction outlays to 30 June, 1906... $29,413 32		
do do during 1906-7 ..... 716 00		
	$30,129 32	
Toronto General Hospital:		
Contribution under above Act	250,000 00	
Physics Building:		
Construction appropriation under above Act	45,000 00	
Men's Residence, appropriation under above Act	50,000 00	
Museum Wing to Science Building, under above Act	50,000 00	
Botanical Glass Houses, under above Act	5,000 00	
Convocation Hall:		
Portion of outlays granted from this fund to 30 June, 1907	61,479 83	
		491,609 15
Unappropriated 30 June, 1907		$87,775 06
Physics Building:		
Advance from Endowment pending realization from grant of Site of Old Parliament Buildings under Act of 1905	$180,000 00	
Appropriation from Annuities as above	45,000 00	
Further advance from Endowment under terms of an Order-in-Council dated 21 September, 1906	125,000 00	
Estimated cost of construction	$350,000 00	
Expended upon Construction to 30 June, 1907, $136,363.09, less Contractor's deposit of $2,161.25	134,201 84	
Unexpended 30 June, 1907	$215,798 16	
Men's Residences, unexpended 30 June, 1907	25,000 00	
Museum Wing, unexpended 30 June, 1907	50,000 00	
Botanical Glass Houses, unexpended 30 June, 1907	5,000 00	

SCHEDULE 4b.—*Continued.*

Faculty of Applied Science, Special Account, unexpended of $49,855.41 voted by the Legislative Assembly of Ontario	$14,698 93	
Faculty of Education, portion of purchase money of School Sites unpaid on 30 June, 1907	53,700 00	
		364,197 09
		$451,972 15

SCHEDULE 5a.

Revenue Accounts.

Contingent Fund, 30 June, 1906	$20,465 92	
Written off 192 Carlton Street, Toronto, to reduce this account to $7,500	2,078 72	
		$18,387 20
Received from the Provincial Treasurer advance payment under 6 Edw. VII., Cap. 55, portion of Instalment due July, 1907, applicable to Revenue of 1907-8		43,371 00
		$61,758 20

Contra.

Fire Insurance premiums paid in advance	12,468 72
	$49,289 48

SCHEDULE 5b.

Income Accrued but not Due.

	30th June, 1907.	30th June, 1906.
Debentures	$6,611 81	$6,534 89
Mortgages	2,246 76	2,795 95
Park Rentals	6,277 87	6,277 87
Business Rentals	703 84	693 84
City of Toronto	1,500 00	1,500 00
Interest from Land Sales	984 62	1,699 19
		$19,501 74
	$18,324 90	18,324 90
Difference		$1,176 84

SCHEDULE 5c.

Revenue 1906-7.

Receipts.

	Estimate.	Actual.
Interest:		
On purchase moneys	$6,250 00	$4,587 39
On Loans	9,000 00	8,527 30
On Debentures	13,000 00	13,412 67
On Bank balances	2,000 00	3,305 78
Share Cost of New Medical Building	3,000 00	.....
Share Cost of Medical Equipment	1,073 23	.....
Rents:		
University Park properties	15,000 00	15,457 09
Business properties	2,900 00	2,939 39
Grand Trunk Railway Company	.....	3,000 00
City of Toronto payment	6,000 00	6,000 00
Legislative Grant, 60 Vic., Cap. 59	7,000 00	7,000 00
Legislative Grant, Act of 1906	254,965 18	213,258 00
Sundry Earnings Land	450 00	1,324 55

SCHEDULE 5c.—*Continued.*

	Estimate.	Actual.
Casual Receipts	.....	100 59
University and College Fees	165,000 00	184,211 17
	$485,638 41	$463,123 93
Less Interest upon Trust Funds, reserved	12,000 00	10,871 36
	$473,638 41	$452,252 57
Contra.		
Appropriations as per Estimates	413,100 50	411,696 44
	$60,537 91	$40,556 13
Unexpended of maintenance account of School of Practical Science transferred under section 13 of University Act, 1906, ($39,671.82; less, $33,434.07)	$6,237 75	
Written off Dining Hall Equipment	2,092 19	
		4,145 56
Transferred to General Endowments Fund	.....	$44,701 69

SCHEDULE 5d.

Summary of Revenue Expenditures, 1906-7.

I. Faculty of Arts: $291,788.31.

	Appropriation.	Supplementary.	Unused.
1. Salaries	$172,112 50	$4,791 73	
2. President's Office	1,900 00	.....	259 30
3. Bursar's Office	1,000 00	202 50	
4. Registrar's Office	3,700 00	.....	192 40
5. Law Costs	1,250 00	341 10	
6. General Incidentals	2,500 00	.....	1,254 65
7. Insurance	2,500 00	988 33	
8. Telephones	500 00	.....	113 50
9. Convocation Expenses	2,000 00	.....	533 99
10. Examinations	17,970 00	615 16	
11. Advertising (University)	600 00	.....	29
12. Incidentals (University)	300 00	.....	4 20
13. Library	9,290 00	.....	239 26
14. Museum	2,500 00	218 82	
15. Gymnasium and Students' Union	2,070 00	.....	840 15
16. Grounds	6,000 00	.....	609 48
17. Main Building	8,850 00	795 46	
18. Biological Building and Department	13,410 00	.....	180 32
19. Physiological Department	4,300 00	.....	35 31
20. Chemical Building and Department	4,960 00	.....	591 76
21. Physical Department	4,000 00	.....	5 13
22. Geological and Mineralogical Department	6,150 00	.....	385 41
23. Psychological Department	1,100 00	.....	600 00
24. Mathematical Department	50 00	.....	22 88
25. Astronomical Department	350 00	97 95	
26. Political Science	50 00	.....	39 08
27. History	50 00	.....	17 25
28. Italian and Spanish	50 00	.....	30
29. University Studies	1,350 00		
30. Dining Hall	500 00		
31. Educational Association Reception	250 00	.....	4 00
32. Summer Session 1906	3,000 00	.....	92 43
33. Memorial Volume	2,650 00	.....	13 19
34. Art Reproductions	900 00	.....	88 43
35. Senate Elections	1,000 00	.....	226 25
36. Trinity College	250 00	.....	22 81
37. Pensions	5,500 00		

SCHEDULE 5*d*—*Continued.*

	Appropriation.	Supplementary.	Unused.
38. University College Departments: ($1,266.81).			
Classics	$140 00	.....	$50 96
English	200 00		
French	100 00	.....	21 80
German	100 00	.....	9 79
Orientals	60 00	.....	20
Stationery	100 00	.....	6 67
Printing	100 00	.....	47 59
Advertising	100 00	.....	18 56
Incidentals	525 00	.....	2 62
39. Unforeseen and unprovided for	5,000 00	.....	1,070 23
Totals for Faculty of Arts	$291,337 50	$8,051 05	$7,600 24
II. Faculty of Medicine: $57,360.83.			
1. Salaries	$42,882 00	$1,679 81	
2. Anatomy	2,950 00	.....	$1,092 06
3. Pathology and Departments other than Anatomy	3,000 00	.....	916 93
4. Medical Building	3,435 00	29 97	
5. General Expenses	3,960 00	.....	766 96
6. Special Instruction to Women Students.	.....	2,200 00	
Totals for Faculty of Medicine	$56,227 00	$3,909 78	$2,775 95
III. Faculty of Applied Science: $53,547.30 (6 months only, January-June, 1907).			
1. Salaries	$33,661 00	$645 65	
2. Laboratory Supplies	4,500 00	.....	$276 90
3. Laboratory Apparatus, etc	5,800 00	.....	1,712 20
4. Printing, advertising and incidentals	1,800 00	.....	101 95
5. Travelling expenses	800 00	.....	800 00
6. Grant to Engineering Society	100 00	.....	100 00
7. Gas and Electric Light	800 00	107 57	
8. Water	200 00	228 80	
9. Fuel	5,000 00	.....	1,563 48
10. General repairs, furniture, etc	3,575 00	293 76	
11. Temporary help	1,000 00	.....	409 95
12. Fitting up room in C. and M. Building	500 00	.....	500 00
13. Ventilation, Engineering Building	600 00	.....	600 00
Totals for Faculty of Applied Science.	$58,336 00	$1,275 78	$6,064 48
IV. Faculty of Household Science: $6.750.00.			
Salaries	$7,200 00	.....	$450 00
Totals for Faculty of Household Science	$7,200 00	.....	$450 00
V. Faculty of Education	.....	$1,375 00	
VI. Faculty of Forestry	.....	$875 00	
Faculty of Arts	$291,337 50	$8,051 05	$7,600 24
Faculty of Medicine	56,227 00	3,909 78	2,775 95
Faculty of Applied Science	58,336 00	1,275 78	6,064 48
Faculty of Household Science	7,200 00	.....	450 00
Faculty of Education	.....	1,375 00	
Faculty of Forestry	.....	875 00	
Appropriation	$413,100 50		
Supplementary Appropriations	15,486 61	$15,486 61	
	$428,587 11		
Unused	16,890 67	.....	$16,890 67
Total expenditure from Revenue, 1906-7	$411,696 44		

SCHEDULE 6.

Site Lands, Buildings and Contents, 30 June, 1907.

Return of 30 June, 1906		$2,173,223 28
Purchase of Vacant land 142 x 265 ft. on College Street, West of Technical School		28,675 00
Purchase of Sites for Schools, Faculty of Education:		
S.W. Cor. Bloor and Huron Street, 150 x 189 5/12 ft.		26,048 00
S.E. Cor. Bloor and Spadina Avenue, 77,216 square ft.		70,000 00
Transfer from Leased Lands Account of Site land of School of Applied Science		18,500 00
Women's Residence (Queen's Hall) Construction outlays 1906-7		716 00
Transfer from Investment Account of Medical Faculty Equipment advance (Schedule 9)		26,830 73
Library proper, 1906-7 additions:		
Books added as per Accession Catalogue	$7,070 12	
Less 3% upon $143,628.20 for the year's depreciation	4,308 84	
		2,761 28
		$2,346,754 29
Less.		
Residence Dining Hall Equipment, Amount written off		2,092 19
		$2,344,662 10

SCHEDULE 7.

Unproductive Lands.

Vacant land in Port Hope	$5,690 00	
Vacant land near Belleville	1,755 00	
Farm lands	152 00	
U. C. C. King Street block	55,029 80	
192 Carlton St., Toronto	7,500 00	
		$70,126 80
Transactions 1906-7.		
U. C. College block, land sales cancelled		$29,200 00
Less.		
Received to 30 June, 1907, on account of Hollway settlement	$4,170 20	
Sale to Grand Trunk Railway of 3.12 acres vacant land in Port Hope	705 00	
Carlton Street land, written off (to reduce valuation to $7,500)	2,078 72	
		6,953 92
		$22,246 08
Return of 30 June, 1906		47,880 72
Return of 30 June, 1907		$70,126 80

SCHEDULE 8.

Leased Lands, etc.

Victoria College Site	$1 00	
Wycliffe College Site	2,500 00	
Observatory Site, S. W. Cor. Bloor St and Devonshire Place, 150 x 275 feet	1 00	
Land leased to the City of Toronto	120,000 00	
Park Lands	239,080 00	
Toronto business property	66,038 10	
Caradoc Farm	2,000 00	
		$429,620 10

SCHEDULE 8.—*Continued.*

47 St. George Street, Toronto	$10,172 95	
59 St. George Street, Toronto	8,031 85	
69 St. George Street, Toronto	14,500 00	
8 University Crescent	14,842 75	
13 Queen's Park	10,000 00	
		$57,547 55
Site of Old Parliament buildings 9.344 acres vested in University under Act of 1905, against which the University is to advance towards the erection of the new Physics Building the sum of		$180,000 00
Wycliffe College pavement	$1,020 70	
Rentals, past due	73 60	
Rentals, accrued but not due	6,981 71	
City of Toronto payment	1,500 00	
		$9,576 01
		$676,743 66

Transactions 1906-7.

School of Science Site land, transferred to Site Lands account	$18,500 00	
Wycliffe College pavement, Instalment $75 less interest portion $36.25	38 79	
Reduction in outstanding revenue	901 40	
		$19,440 19

Contra.

Site land of Old Parliament Buildings	$180,000 00	
Purchase of 69 St. George St., Toronto	14,500 00	
		$194,500 00
		$175,059 81
Return of 30th June, 1906		501,683 85
Return of 30th June, 1907		$676,743 66

SCHEDULE 9.

Investments 30 June, 1907.

Debentures and Municipal bonds	$360,396 99	
Interest past due	305 29	
Interest accrued but not due	6,611 81	
		$367,314 09
Loans secured by Mortgages on real property	$151,843 46	
Interest past due	348 65	
Interest accrued but not due	2,246 76	
		154,438 87
Unpaid purchase money upon land sales	$74,441 50	
Interest accrued but not due	878 76	
		75,320 26
Dominion Power and Transmission Co. shares	$2,000 00	
Less excess of income received	25 00	
		1,975 00
University Press accounts uncollected	$576 55	
Queen's Hall accounts uncollected	46 30	
Deposit in Canadian Bank of Commerce	194,813 93	
		195,436 78
		$794,485 00

Transactions 1906-7.

Inwards.

Debenture collections	$12,816 07
Mortgage loans repaid	32,626 96
Purchase money collections	43,370 28
Land Sales cancelled	29,200 00

SCHEDULE 9.—*Continued.*

Decrease in accrued revenue	$1,635 38	
Medical Faculty Equipment advance transferred to Schedule 6	26,830 73	
Convocation Hall outlays charged to Annuity Grant Account	33,566 68	
Collected from Provincial Treasurer (1905-6 acct.)	60,953 68	
Decrease in Accounts receivable outstanding	728 66	
Dominion P. T. Co excess income	15 00	
Withdrawals from Can. Bank of Commerce	1,193,868 21	
		1,435,611 65
Outwards.		
Land Sales	$905 00	
Debentures purchased	42,536 57	
Deposits in Can. Bank of Commerce	1,325,352 27	
		1,368,793 84
Decreased outstandings		$66,817 81
Return of 30 June, 1906		861,302 81
Return of 30 June, 1907		$794,485 00

APPENDIX II.

Fees, 1906-7.

Total of Fees collected during 1906-7			$184,281 17
Deduct arrears of 1905-6 collected		$40 00	
Fees written off:			
1 Degree fee	$10 00		
4 Laboratory fees	4 00		
1 Library fee	2 00		
1 Examination fee	14 00		
		30 00	
			70 00
Fees of 1906-7			$184,211 17

Details of Fees received, 1906-7.

Subject.	1st year.	2nd year.	3rd year.	4th year.	Miscellaneous.	Total.
I. Faculty of Arts:	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
Tuition Fees	8,884 00	5,600 00	4,568 00	4,043 00	61 00	23,156 00
Penalties	43 00	33 00	33 00	91 00	.....	200 00
Dispensations	10 00	20 00	45 00	15 00	.....	90 00
Honor Certificates	.....	.....	.....	.....	61 00	61 00
Matriculation	26 00	.....	.....	.....	740 00	766 00
Ad Eundem	10 00	60 00	.....	10 00	15 00	95 00
Examinations	5,006 00	5,008 00	3,770 00	3,017 00	1,017 00	17,818 00
Degrees	.....	.....	.....	1,630 00	370 00	2,000 00
Chemical Supply	102 00	118 00	123 00	30 00	.....	373 00
Mineralogical Supply	.....	30 00	18 00	9 00	.....	57 00
Biological "	98 00	113 00	200 00	270 00	.....	681 00
Physiological "	.....	.....	6 00	90 00	.....	96 00
Physical "	76 00	48 00	89 00	80 00	4 00	297 00
Psychological "	1 00	.....	54 00	91 00	.....	146 00
Laboratory Instruction (occasional students)	.....	.....	.....	.....	100 00	100 00
Teachers' Course	.....	.....	.....	.....	622 00	622 00
Summer Session 1906	.....	.....	.....	.....	275 00	275 00
Library	736 00	548 00	428 00	338 00	2 00	2,052 00
Gymnasium	300 00	208 00	168 00	132 00	153 00	961 00
	15,292 00	11,786 00	9,502 00	9,846 00	3,420 00	49,846 00

Details of Fees Received, 1906-7.—Continued.

Subject.	1st year.	2nd year.	3rd year.	4th year.	Miscellaneous.	Total.
II. Faculty of Medicine:	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
Tuition Fees	16,957 00	13,331 00	15,277 00	15,298 00	1,475 00	62,338 00
Penalties	.....	160 00	.....	.....	.....	160 00
Registration	880 00	25 00	25 00	.....	.....	930 00
Honor Certificates	.....	.....	.....	.....	4 00	4 00
Matriculation	39 00	10 00	12 00	12 00	5 00	78 00
Ad Eundem	.....	.....	40 00	.....	.....	40 00
Examinations	2,026 00	2,042 00	2,401 00	2,292 00	375 00	9,136 00
Degrees	.....	.....	.....	2,460 00	100 00	2,560 00
Chemical Supply	459 00	354 00	.....	.....	3 00	816 00
Biological "	304 00	360 00	.....	.....	2 00	666 00
Physiological "	459 00	600 00	.....	.....	3 00	1,062 00
Library	308 00	234 00	.....	.....	.....	542 00
Gymnasium	112 00	52 00	48 00	12 00	56 00	280 00
	21,544 00	17,168 00	17,803 00	20,074 00	2,023 00	78,612 00
III. Faculty of Applied Science						
Tuition Fees	17,938 00	13,360 00	10,494 00	8,825 00	.....	44,617 00
Matriculation	33 00	.....	.....	.....	.....	33 00
Examinations	.....	.....	.....	420 00	30 00	450 00
Degrees	.....	.....	.....	410 00	10 00	420 00
Gymnasium	308 00	276 00	148 00	44 00	.....	776 00
	18,279 00	13,636 00	10,642 00	3,699 00	40 00	46,296 00
IV. Faculty of Household Science:						
Tuition Fees	.....	.....	.....	.....	2,419 17	2,419 17
Examinations	.....	.....	.....	.....	195 00	195 00
Degrees	.....	.....	.....	.....	60 00	60 00
Chemical Supply	.....	.....	.....	.....	16 00	16 00
Biological "	.....	.....	.....	.....	8 00	8 00
Physiological "	.....	.....	.....	.....	106 00	106 00
Laboratory Instruction	.....	.....	.....	.....	240 00	240 00
	.....	.....	.....	.....	3,044 17	3,044 17

Departmental Fees.

Subject.	Law.	Dentistry.	Music.	Pharmacy	Pedagogy.	Total.
	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
Matriculation	150 00	280 00	.....	135 00	.....	565 00
Examination	230 00	810 00	2,598 00	336 00	20 00	3,994 00
Degrees	220 00	450 00	20 00	260 00	10 00	960 00
Certificates	.....	.....	519 00	.....	.....	519 00
	600 00	1,540 00	3,137 00	731 00	30 00	6,038 00

Summary of 1906-7 Fees.

I. Faculty of Arts:		
1st year	$15,292 00	
2nd year	11,786 00	
3rd year	9,502 00	
4th year	9,846 00	
Miscellaneous	3,420 00	
		$49,846 00
II. Faculty of Medicine:		
1st year	21,544 00	
2nd year	17,168 00	
3rd year	17,803 00	
4th year	20,074 00	
Miscellaneous	2,023 00	
		78,612 00
III. Faculty of Applied Science:		
1st year	18,279 00	
2nd year	13,636 00	
3rd year	10,642 00	
4th year	3,699 00	
Miscellaneous	40 00	
		46,296 00
IV. Faculty of Household Science:		
Miscellaneous	3,044 17	
		3,044 17
V. Departmental:		
Law	600 00	
Dentistry	1,540 00	
Music	3,137 00	
Pharmacy	731 00	
Pedagogy	30 00	
Agriculture	445 00	
		6,483 00
	$184,281 17	$184,281 17

Classification of Services.

Tuition Fees, Arts	$23,356 00	
Tuition Fees, Medicine	62,498 00	
Tuition Fees, Applied Science	44,617 00	
Tuition Fees, Household Science	2,419 17	
Dispensation	90 00	
Honor Certificates	584 00	
Registration	930 00	
Matriculation	1,442 00	
Ad Eundem	135 00	
Examination	31,593 00	
Degrees	6,000 00	
Chemical Supply	1,205 00	
Mineralogical Supply	57 00	
Biological Supply	1,355 00	
Physiological Supply	1,264 00	
Physical Supply	297 00	
Psychological Supply	146 00	
Laboratory Instruction for occasional students	340 00	
Teachers' Course	622 00	
Summer Session, 1906	275 00	
Library	2,594 00	
Gymnasium (including lockers)	2,017 00	
Agriculture	445 00	
		$184,281 17

Recapitulation.

University Fees proper	$51,391 00	
University College proper	23,356 00	
Medicine	62,498 00	
Applied Science	44,617 00	
Household Science	2,419 17	
		184,281 17

APPENDIX III.

Details of Expenditure from Revenue 1906-7.

I. *Salaries, University and University College.*

1. Faculty, University of Toronto.

Mathematics.

		10 per cent. increase, six months from 1st January.	
Alfred Baker, Professor, 12 months' salary.....	$3,200 00	$160 00	
A. T. DeLury, Associate Professor, 12 months' salary	2,200 00	110 00	
M. A. Mackenzie, Associate Professor, 12 months' salary	2,200 00	110 00	
J. C. Fields, Associate Professor, 12 months' salary	2,000 00	100 00	
N. B. McLean, Fellow (Sessional)	500 00		
			$10,580 00

Physics.

W. J. Loudon, Associate Professor, 12 months' salary	$2,200 00	$110 00	
J. C. McLennan, Associate Professor, 12 months' salary	2,200 00	110 00	
E. F. Burton, Demonstrator, 12 months' salary.	1,500 00	75 00	
L. Gilchrist, Demonstrator, 12 months' salary.	1,200 00	60 00	
Miss L. B. Johnson, Assistant Demonstrator (Sessional)	850 00		
W. Keast, Assistant Demonstrator (Sessional).	500 00		
D. B. Nugent, Assistant Demonstrator (Sessional)	500 00		
J. A. Gardiner, Lecture Assistant (Sessional)...	500 00		
T. S. Plaskett, Mechanician, 12 months' salary.	900 00		
W. H. Fox, Assistant Mechanician, 11½ months' salary	670 83		
W. Corrigan, Engineer, Physics Building, 1¾ months' salary	162 58		
			$11,538 41

Astronomy.

C. A. Chant, Lecturer, 12 months' salary.....	1,800 00	90 00	
			$1,890 00

Geology and Mineralogy.

A. P. Coleman, Professor, Geology, 12 months' salary	$1.000 00	$50 00	
T. L. Walker, Professor, Mineralogy, 12 months' salary	2,975 00	150 00	
W. A. Parks, Associate Professor, Geology, 12 months' salary	1,900 00	95 00	
A. L. Parsons, Lecturer, Mineralogy, 5¼ months' salary	653 25	65 33	
Henry Montgomery, Curator of New Museum, 12 months' salary	2,500 00	125 00	
W. F. Green, Class Assistant, Mineralogy, (Sessional)	500 00		
W. Stewart, Attendant, Mineralogy, 12 months' salary	500 00		
A. Enwright, Attendant, Geology, 12 months' salary	300 00		
			$10,813 58

Chemistry.

W. R. Lang, Professor, 12 months' salary	$3,100 00	$155 00	
W. Lash Miller, Associate Professor, 12 months' salary	2,400 00	120 00	
F. B. Kenrick, Lecturer and Associate Professor, 12 months' salary	1,675 00	90 00	
F. B. Allan, Lecturer, 12 months' salary	1,575 00	80 00	
J. A. M. Dawson, Assistant (Sessional)	500 00		
R. B. Stewart, Fellow, 3 months' salary	187 50		
A. T. Stuart, Junior Assistant, 5 months' salary	250 00		
T. B. Allan, Junior Assistant (Sessional)	400 00		
K. J. McRae, Junior Assistant (Sessional)	400 00		
J. F. Mackey, Junior Assistant (Sessional)	400 00		
R. J. Manning, Junior Assistant (Sessional)	400 00		
E. Repath, Caretaker, Chemical Building, 12 months' salary	600 00		
J. Smith, Cleaner, Chemical Building, 12 months' salary	300 00		
G. Donkin, Fireman, Chemical Building, 8 months' salary	300 00		
			$12,932 50

Biology.

R. Ramsay Wright, Professor, 12 months' salary	$3,200 00	$160 00	
B. A. Bensley, Associate Professor Zoology, 12 months' salary	1,800 00	90 00	
W. H. Piersol, Lecturer Histology, 12 months' salary	1,400 00	70 00	
E. Walker, Lecturer Zoology, 12 months' salary	1,000 00	50 00	
E. Boyd, Lecturer and Laboratory Assistant (Sessional)	500 00		
A. G. Huntsman, Class Assistant (Sessional)	250 00		
M. D. McKichan, Class Assistant (Sessional)	150 00		
A. J. Mackenzie, E. A. McCulloch, W. A. Scott, E. C. Cole, C. M. Hincks, I. R. Bell, W. H. Tytler, P. G. Brown — Class Assistants (Sessional) at $50.00 each	400 00		
A. Pride, Sub-Curator Museum, 12 months' salary	800 00		
D. Clark, Caretaker Biological Building, 12 months' salary	650 00		
H. Sherman, Laboratory Attendant, 12 months' salary	300 00		
Sub-Department of Botany:			
J. H. Faull, Lecturer, 12 months' salary	1,475 00	75 00	
R. B. Thomson, Lecturer, 12 months' salary	1,100 00	55 00	
			$13,525 00

Physiology.

A. B. Macallum, Professor of Physiology and Physiological Chemistry, 12 months' salary	$3,200 00	$160 00	
V. E. Henderson, Temporary Lecturer for Session	300 00		
Miss M. L. Edward, W. B. Large, E. Fidlar, W. F. McPhedran, J. D. London — Class Assistants (Sessional) at $100.00 each	500 00		

Physiology.—Continued.

A. C. Hendrick, W. H. Cronyn, F. C. Harrison, I. R. Bell, C. E. Rowland, P. B. MacFarlane, R. G. Armour	Class Assistants (Sessional) at $60.00 each...	420 00	
C. Beswicke, Laboratory Attendant, ¾ month....		26 25	
D. Main, Laboratory Attendant, 4 months' salary		120 00	
			$4,726 25

History and Ethnology.

G. M. Wrong, Professor, 12 months' salary.....	$3,200 00	$160 00	
E. J. Kylie, Lecturer, 12 months' salary.....	1,500 00	75 00	
A. G. Brown, Occasional Assistant (part time)...	300 00		
			$5,235 00

Italian and Spanish.

W. H. Fraser, Professor, 12 months' salary.....	$3,000 00	$150 00	
F. J. A. Davidson, Associate Professor, 12 months' salary	1,800 00	90 00	
M. A. Buchanan, Lecturer, 12 months' salary..	1,200 00	60 00	
			$6,300 00

Philosophy, including Psychology.

A. Kirschmann, Professor, 12 months' salary...	$2,800 00	$140 00	
F. Tracy, Associate Professor, 12 months' salary	1,900 00	95 00	
A. H. Abbott, Lecturer and Laboratory Assistant, 12 months' salary	1,500 00	75 00	
W. G. Smith, Lecturer and Laboratory Assistant, 12 months' salary	1,200 00	60 00	
T. R. Robinson, Lecturer, 12 months' salary.....	1,000 00	50 00	
F. L. Barber, Class Assistant (Sessional).....	500 00		
Miss M. Jansen, Class Assistant (Sessional) ...	300 00		
J. Allan, Attendant, 7¾ months' salary	229 50		
			$9,849 50

Political Science.

J. Mavor, Professor, 12 months' salary.....	$3,200 00	$160 00	
S. J. McLean, Associate Professor, 12 months' salary	2,200 00	110 00	
J. McGregor Young, Professor Constitutional and International Law and Contitutional History, 12 months' salary	1,800 00	90 00	
A. H. F. Lefroy, Professor Roman Law, Jurisprudence and History of English Law, 12 months' salary	1,000 00	50 00	
			$8,610 00
			$96,000 24

2. Faculty, University College.

Greek.

M. Hutton, Professor, 12 months' salary.....	$3,200 00	$160 00	
A. Carruthers, Associate Professor, 12 months' salary	2,100 00	105 00	
W. H. Tackaberry, Instructor (Sessional)	1,000 00		
			$6,565 00

Latin.

J. Fletcher, Professor, 12 months' salary.....	$3,200 00	$160 00	
W. S. Milner, Associate Professor, 12 months' salary	2,200 00	110 00	
G. W. Johnston, Lecturer, 12 months' salary...	1,800 00	90 00	
Wylie Hart, Special Instructor (Temporary).....	200 00		
A. G. Brown, Instructor (part time)	700 00		
			$8,460 00

English.

W. J. Alexander, Professor, 12 months' salary.	$3,200 00	$160 00	
D. R. Keys, Associate Professor Anglo-Saxon, 12 months' salary	2,200 00	110 00	
M. W. Wallace, Lecturer, 12 months' salary...	1,700 00	85 00	
A. M. Burnham, Lecturer (Sessional)	1,000 00		
			$8,455 00

French.

J. Squair, Professor, 12 months' salary.....	$3,000 00	$150 00	
J. H. Cameron, Associate Professor, 12 months' salary	2,200 00	110 00	
St. Elme de Champ, Lecturer, 12 months' salary	1,500 00	75 00	
A. F. B. Clark, Instructor (Sessional)	1,000 00		
			$8,035 00

German.

W. H. Vander Smissen, Professor, 12 months' salary	$3,000 00	$150 00	
G. H. Needler, Associate Professor, 12 months' salary	2,100 00	105 00	
P. Toews, Lecturer, 12 months' salary	1,500 00	75 00	
P. W. Mueller, Instructor (Sessional)	1,000 00		
			$7,930 00

Oriental Languages.

J. F. McCurdy, Professor, 12 months' salary...	$3,200 00	$160 00	
R. Davidson, Associate Professor, 12 months' salary	1,800 00	90 00	
T. Eakin, Lecturer, 12 months' salary.....	1,500 00	75 00	
			$6,825 00

Ethics.

J. G. Hume, Professor, 12 months' salary	$3,200 00	$160 00	
			$3,360 00

University College General.

Dr. M. Hutton, Principal	$400 00	$20 00	
M. W. Wallace, Registrar, 9 months' salary.....	375 00	25 00	
Mrs. M. Campbell, Dean of Women's Residence, 12 months' salary	1,000 00	50 00	
Miss L. Salter, Lady Superintendent, 12 months' salary	700 00	35 00	
			$2,605 00
			$52,235 00

(3) Administrative Departments and General Service.

President's Office.

Dr. R. A. Falconer, President, ½ months' salary	$333 33		
Dr. M. Hutton, President pro tempore, (Honorarium)	2,000 00		
Dr. R. Ramsay Wright, Vice President, 12 months' salary	400 00	20 00	
			$2,753 33

Bursar's Office.

F. A. Mouré, Bursar, 12 months' salary	$2,600 00	$130 00	
T. A. Reed, Accountant, 10½ months' salary	875 00	50 00	
H. J. Bolitho, Fees Clerk, 12 months' salary	1,100 00	55 00	
Miss A. M. Gall, Clerk and Stenographer, 12 months' salary	550 00	27 50	
Miss J. C. Laing, Clerk and Stenographer, 4 months' salary	166 66		
			$5,554 16

Registrar's Office.

J. Brebner, Registrar, 12 months' salary	$2,000 00	$100 00	
Miss A. W. Patterson, Registrar's Assistant, 12 months' salary	850 00	42 50	
Miss E. M. Dickson, Clerk, 12 months' salary	540 00	27 00	
Miss L. G. Stoner, Stenographer, 12 months' salary	480 00	24 00	
Miss M. White, Stenographer, 12 months' salary	480 00	24 00	
			$4,567 50

Library.

H. H. Langton, Librarian, 12 months' salary	$2,500 00	$125 00	
Miss M. H. Buchan, 1st Assistant, 3 months' salary (resigned)	175 00		
Miss F. B. Arnoldi, 1st Assistant, 12 months' salary	650 00	32 50	
Miss G. Buchan, 2nd Assistant, 9 months' salary	412 50	27 50	
Miss F. E. Brown, 3rd Assistant, 9 months' salary	375 00	25 00	
Miss H. Young, Cataloguer, 12 months' salary	550 00	27 50	
Miss E. Aldridge, Assistant Cataloguer, 12 months' salary	360 00	18 00	
Miss E. Creighton, Delivery Clerk (Sessional)	180 00		
Miss A. Baines, Delivery Clerk (Sessional)	180 00		
S. H. Fussell, Caretaker Library Building, 12 months' salary	700 00		
			$6,338 00

Gymnasium.

J. C. Sherry, Secretary Athletic Association, 12 months' salary	$600 00		
A. Williams, Instructor, 12 months' salary	1,000 00	50 00	
G. Hare, Caretaker, 12 months' salary	700 00		
			$2,350 00

General Service.

F. Darling, Architect (Honorarium)	$100 00		
R. J. Hamilton, Bookkeeper at printing office, 12 months' salary	500 00	25 00	
R. Martin, Bedel, 12 months' salary (with free house)	750 00		
C. E. Bradshaw, Janitor, 12 months' salary	650 00		

General Service.—Continued.

F. Hanmer, Engineer, 12 months' salary, (with house and fuel)	$700 00	
A. McConnell, Fireman, 8 months' salary	400 00	
J. Wicksey, Carpenter, 12 months' salary	750 00	
J. Laballister, Cleaner, 12 months' salary	600 00	
S. Richardson, Cleaner, 12 months' salary	450 00	
A. Free, Cleaner, 7 months' salary	280 00	
G. Trotter, Gardener, 12 months' salary (including allowance for house, $300)	800 00	
G. Hagan, Nightwatchman, 12 months' salary	700 00	
W. Henry, Messenger, 4 months' salary	80 00	
W. Lettan, Messenger, 5½ months' salary	96 00	
F. Hartshorne, Messenger, 2½ months' salary	50 00	
S. Apted, Caretaker Convocation Hall, 3½ months' Salary	175 00	
		$7,106 00
		$28,668 99
Total		$176,904 23

2. *President's Office.*

N.Y. Evening Post, subscription	$12 10	
Weekly Sun, subscription	1 00	
Building Manager Publishing Coy., subscription	1 00	
Globe Printing Coy., advertisement	2 25	
A. J. Reading, photographs, etc.	32 95	
University Press, printing and stationery	33 50	
Office Specialty Mfg. Coy., fyling cabinet	42 20	
Prof. J. C. McLennan, cost of cable to Prof. Thomson of Cambridge	6 00	
Prof. Ramsay Wright, expenses re Pollard Lecture	3 50	
Townsend's Livery cab hire	2 75	
Doane Bros., cab hire	2 00	
Travelling expenses under administration of President:		
Prof. A. B Macallum	340 00	
Prof. L. B. Stewart	112 35	
Dr. J. H. Faull	175 00	
Prof. W. Lash Miller	100 00	
Dr. C. A. Chant	125 00	
Prof. W. J. Alexander	37 85	
Prof. J. Galbraith	28 00	
Prof. M. Hutton	33 25	
M. St. E. DeChamp	25 00	
Prof. A. Baker	25 00	
Prof. J. J. Mackenzie	25 00	
Dr. V. E. Henderson	25 00	
Dr. E. M. Walker	25 00	
Prof. J. C. McLennan	25 00	
Prof. T. L. Walker	25 00	
Prof. G. M. Wrong	25 00	
Prof. A. P. Coleman	25 00	
Prof. W. R. Lang	25 00	
Prof. R. Ramsay Wright	25 00	
Prof. W. A. Parks	25 00	
Prof. J. C. Fields	25 00	
Prof. D. R. Keys	25 00	
Prof. W. H. Ellis	25 00	
Prof. W. H. Vander Smissen	25 00	
Prof. Henry Montgomery	25 00	
Dr. F. B. Allan	25 00	
Dr. W. H. Piersol	25 00	
R. B. Thomson	25 00	
A. F. B. Clark	25 00	
Dr. M. W. Wallace	25 00	
		$1,640 70

3. Bursar's Office.

Grand & Toy, cheque books, stationery, etc	$212 96	
University Press, printing and stationery	227 92	
Five in One Envelope Coy., envelopes	16 25	
Office Specialty Mfg. Coy., desk and card cabinet	43 62	
John Kay, Son & Coy., desk and table	51 00	
G. N. Reynolds & Coy., chair	6 50	
United Typewriter Coy., typewriter	110 00	
Gripton Mfg. Coy., rubber stamps	8 00	
The Bursar, postage, $125; petty disbursements $75	200 00	
Ontario Rubber Coy., tubing	2 25	
Miss M. Buck, assistance in office	24 00	
W. H. Cross, auditor's remuneration	300 00	
		$1,202 50

4. Registrar's Office.

University Press, stationery	$259 51	
Grand & Toy, office supplies	42 25	
Brown & Stainton, office supplies	4 40	
National Typewriter Coy., rent of typewriter, supplies, etc.	8 50	
Wm. Tyrell & Coy., Almanacs	4 50	
Carswell Coy., Law List	2 50	
Office Specialty Coy., desk, etc	47 70	
Art Metropole, tacks	1 19	
Rice Lewis & Son, lock	1 75	
The Registrar, petty disbursements	100 00	
The Bursar, postage supplied	848 00	
H. J. Bolitho, assistance in preparation of lists	11 00	
University Press, printing	467 46	
University Press, printing Calendar and Curricula	1,664 75	
Trinity College, Calendars supplied by them	64 72	
	$3,528 23	
Less waste paper sold	20 63	
		$3,507 60

5. Law Costs.

John A. Paterson, K.C., legal services as Solicitor to University	$1,632 60	
Less mortgage discharges, etc., paid by the parties concerned	41 50	
		$1,591 10

6. General Incidentals.

A. G. Wyon, seal	$207 04	
C. W. Irwin, duty, etc., on seal	41 80	
H. H. Williams, commissions *re* leases	110 00	
J. H. Diamond, valuation fee	5 00	
Speight & Van Nostrand, surveying	41 00	
W. A. Browne, surveying and plans	24 00	
City Treasurer, adjustment of local improvement taxes, 1906, 7 Queen's Park	8 51	
Ontario Medical Library, taxes on 7 Queen's Park, 1905, paid by them in error	8 51	
W. H. Adamson, services *re* Insurance schedule	30 00	
R. G. McLean, printing Insurance schedule	18 50	
E. W. Gillett Coy., share of fence, U. C. C. Block	34 00	
Aid to University Y.M.C.A.:		
Stinson & Coy., repairs at Y.M.C.A. Building... $42 13		
Elias Rogers & Coy., fuel for Y.M.C.A. Building. 87 56		
	129 69	
London Guarantee & Accident Coy., premium on fidelity bonds	165 00	

6. *General Incidentals.*—Continued.

Travelling expenses of Board of Governors and Senate:

Board of Governors:		
Judge Snider	$105 00	
Rev. Dr. Teefy	29 00	
Members of Senate:		
Barlow Cumberland	13 20	
Dr. W. Burt	30 15	
J. H. Coyne	28 30	
J. Chisholm	8 00	
W. N. Ponton	13 95	
E. A. James	31 25	
T. G. Raynor	7 85	
R. A. Thompson	10 00	
C. A. Mayberry	23 00	
W Dale	40 80	
C. H. Mitchell	16 80	
G. C. Creelman	5 00	
		$1,245 35

7. *Insurances.*

Premiums on General Schedule, 3 years from 1st January, 1907:

Ætna Insurance Coy		$841 70
Royal Insurance Coy		841 70
Scottish Union & National Ins. Coy		841 70
Liverpool & London & Globe Ins. Coy		841 70
Queen City Ins. Coy		841 70
Atlas Assurance Coy		841 70
North British and Mercantile Ins. Coy		841 70
Norwich Union Fire Ins. Coy		841 70
Hartford Fire Ins. Coy.	$841 70	
Less rebate	7 56	
		834 14
Northern Assurance Coy	$841 70	
Less rebate	453 15	
		388 55
Western Assurance Coy	$841 70	
Less rebate	67 00	
		774 70
British America Assurance Coy	$841 70	
Less rebate	352 00	
		489 70
London & Lancashire Fire Ins. Coy	$841 70	
Less rebate	468 55	
		373 15
London Assurance Corporation	$841 70	
Less rebate	182 40	
		659 30
Alliance Assurance Coy	$841 70	
Less rebate	360 95	
		480 75
Mercantile Fire Ins. Coy		420 85
Quebec Fire Insurance Coy		420 85
Sun Insurance Office		420 85
Guardian Assurance Coy		420 85
Perth Mutual Fire Insurance Coy		420 85
Phoenix Assurance Coy. of London		420 84
Commercial Union Assurance Coy	$420 85	
Less rebate	90 70	
		330 15
Home Insurance Coy	$420 85	
Less rebate	360 95	
		59 90
Connecticut Fire Insurance Coy		105 20
Fire Insurance Exchange Corporation		105 20
Hand-in-Hand Insurance Coy		105 20
Union Assurance Society of London		105 20

Insurances.—Continued.

Phoenix Insurance Coy. of Hartford		$105 20	
London Mutual Fire Insurance Coy		105 20	
Waterloo Mutual Fire Insurance Coy		105 20	
Queen Insurance Coy	$105 20		
Less rebate	38 16		
		67 04	
Boiler Inspection and Insurance Coy		510 00	
		$14,962 47	
One-sixth of above amount charged to Revenue 1906-7 (balance carried forward)			$2,493 75
Sundry Companies: Workmen's Risk, Convocation Hall			785 15
Casual Premiums:			
British America Assurance Coy.:			
Printing Plant			78 68
Athletic Field, Grand Stand, etc			50 00
Home Insurance Coy.: No. 69 St. George Street			48 75
Norwich Union Assurance Society:			
Upper Canada College Block			26 35
Hartford Fire Insurance Coy. / Western Fire Assurance Coy. } No. 13 Queen's Park (temporary)			3 50 / 2 15
			$3,488 33

8. *Telephones.*

Bell Telephone Coy., Telephone Service:			
Bursar's Office		$62 00	
President and Registrar's Office		62 50	
Chemical Building		50 00	
Printing Bureau		50 00	
Main Building		50 00	
Library		62 00	
Women's Residence		50 00	
			$386 50

9. *Convocation Expenses.*

Dining Hall, garden party and share of banquet to graduating class	$835 92		
Less tickets sold	9 00		
		$826 92	
G. Harcourt & Son, hoods		200 00	
Highlanders' Band		45 00	
Chief of Police, services of constables		13 00	
Preparing Hall for Convocation:			
Mackenzie & Coy., moving pictures	$28 25		
C. M. Richardson, cartage	29 00		
Fletcher Mfg. Coy., brooms, etc	47 25		
W. J. Saunderson, cleaning materials	62 53		
R. Simpson Coy., towels, floor cloths, etc.	12 41		
Oscar Apted, cleaning	20 40		
Mrs. Hudson, cleaning	8 10		
Mrs. McKerrow, cleaning	15 00		
Miss May, cleaning	15 00		
		237 94	
University Press, printing		143 15	
			$1,466 01

10. *Examinations.*

(*a*) Remuneration to Examiners:

Arts:		
A. H. Abbott	$46 50	
Miss M. E. T. Addison	35 00	
W. J. Alexander	94 50	
F. B. Allan	19 63	
W. T. Allison	26 00	

10. *Examinations.*—Continued.

J. W. G. Andras	$153 75
A. R. Bain	31 13
A. Baker	159 41
J. S. Bennett	49 13
B. A. Bensley	41 00
G. J. Blewett	40 00
A. G. Brown	65 25
M. A. Buchanan	48 63
A. M. Burnham	53 00
E. F. Burton	20 25
A. Carruthers	83 75
St. E. de Champ	75 75
C. A. Chant	63 75
A. F. B. Clark	67 75
A. P. Coleman	43 75
F. J. A. Davidson	91 63
R. Davidson	65 25
J. A. M. Dawson	6 00
A. T. De Lury	173 01
H. T. F. Duckworth	49 50
T. Eakin	90 25
O. P. Edgar	144 00
J. H. Faull	24 75
J. C. Fields	36 06
J. Fletcher	104 45
W. H. Fraser	59 50
L. Gilchrist	11 50
R. W. Hart	15 25
G. S. Hodgson	13 25
W. Houston	5 25
J. G. Hume	78 00
T. H. Hunt	25 50
M. Hutton	26 25
G. W. Johnston	131 05
F. B. Kenrick	73 38
D. R. Keys	172 25
A. Kirschmann	98 00
E. J. Kylie	94 50
A. E. Lang	83 00
W. R. Lang	34 75
A. L. Langford	75 38
H. H. Langton	47 25
A. H. F. Lefroy	42 25
W. J. Loudon (including expenses $2.64)	127 60
J. F. McCurdy	52 00
J. F. McLaughlin	35 50
N. B. McLean	39 04
S. J. McLean	37 25
J. C. McLennan	120 88
C. A. McRae	11 25
A. B. Macallum	42 50
M. A. Mackenzie	85 93
J. A. C. Mason	45 00
J. Mavor	51 25
A. D. Miller	26 75
W. Lash Miller	51 75
W. S. Milner	91 13
P. W. Mueller	34 50
G. H. Needler	73 50
E. T. Owen	37 88
W. A. Parks	67 00
A. L. Parsons	2 00
W. H. Piersol	51 50
A. Primrose	27 25
A. H. Reynar (including expenses $3.50)	57 75
J. C. Robertson	52 88
T. R. Robinson	77 00
G. O. Smith	79 63

10. *Examinations.*—Continued.

W. G. Smith	$51 75	
J. Squair	93 50	
W. H. Tackaberry	22 50	
R. B. Thomson	12 00	
P. Toews	32 75	
F. Tracy	97 25	
W. H. Vander Smissen	66 00	
E. M. Walker	13 75	
T. L. Walker	41 75	
M. W. Wallace	112 50	
R. Ramsay Wright	159 25	
G. M. Wrong	122 88	
A. H. Young	52 75	
J. McGregor Young	84 25	
W. H. Barraclough (presiding; incl. expenses $12.00)...	149 50	
G. J. Blewett (presiding)	1 50	
M. A. Buchanan (presiding)	3 00	
A. Carruthers (presiding)	27 00	
C. A. Chant (presiding)	37 50	
R. Davidson (presiding)	31 50	
T. Eakin (presiding)	121 50	
L. Gilchrist (presiding)	1 50	
G. W. Johnston (presiding)	7 50	
A. L. Langford (presiding)	15 00	
A. D. Miller (presiding)	10 50	
J. F. McLaughlin (presiding)	9 00	
E. T. Owen (presiding)	34 50	
Mrs. W. S. Pearcy (presiding)	52 50	
T. R. Robinson (presiding)	31 50	
Miss L. Salter (presiding)	22 50	
W. G. Smith (presiding)	25 50	
W. H. Tackaberry (presiding)	21 00	
T. W. Taylor (presiding; including expenses, $1.65).....	34 15	
M. W. Wallace (presiding)	28 50	
D. S. Dix (attendant)	21 00	
W. L. Findlay (attendant)	19 00	
J. Hill (attendant)	40 00	
H. H. McDiarmid (attendant)	64 50	
J. McEachern (attendant)	24 00	
C. A. Malcolm (attendant)	15 00	
J. G. Miller (attendant)	11 50	
D. B. Nugent (attendant)	10 00	
T. D. Park (attendant)	5 00	
J. B. Paulin (attendant)	4 50	
P. Taylor (attendant)	64 00	
W. V. Tilley (attendant)	16 50	
		$6,390 89
Matriculation:		
H. J. Bolitho (presiding)	$52 00	
T. Eakin (presiding)	16 00	
A. E. Lang (presiding)	16 00	
W. S. Milner (presiding)	32 00	
G. Hanmer (attendant)	19 50	
W. V. Tilley (attendant)	13 50	
		$149 00
Medicine:		
H. W. Aikins	$49 25	
F. B. Allan	60 50	
H. B. Anderson	40 25	
A. Baines	19 25	
N. H. Beemer	24 75	
B. A. Bensley	92 50	
G. A. Bingham	35 00	
H. A. Bruce	35 00	
I. H. Cameron	35 00	
M. H. V. Cameron	35 00	
G. Chambers	35 00	

10. *Examinations.*—Continued.

C. A. Chant	$10 50	
C. K. Clarke	19 25	
R. J. Dwyer	35 00	
F. Fenton	35 00	
J. T. Fotheringham	10 00	
L. Gilchrist	68 75	
W. Gilday	35 00	
W. Goldie	35 00	
A. R. Gordon	35 00	
V. E. Henderson	48 75	
G. W. Howland	41 00	
F. B. Kenrick	10 75	
J. A. Kinnear	35 00	
E. E. Kitchen	37 50	
W. R. Lang	77 00	
C. P. Lusk	70 75	
W. McKeown	35 00	
G. D. McLean	35 00	
A. McPhedran	35 00	
J. H. McPhedran	35 00	
A. B. Macallum	64 50	
J. J. Mackenzie	95 25	
W. O'Hara	35 00	
H. C. Parsons	40 25	
W. Peart	35 00	
W. H. Piersol	88 75	
N. A. Powell	49 75	
A. Primrose	31 75	
T. B. Richardson	35 00	
J. F. W. Ross	43 25	
R. D. Rudolf	54 75	
C. B. Shuttleworth	124 50	
G. Silverthorn	35 00	
R. R. Smale	35 00	
C. E. Spence	35 00	
C. L. Starr	57 25	
F. N. G. Starr	35 00	
G. S. Strathy	35 00	
C. A. Temple	12 50	
L. Teskey	35 00	
R. B. Thomson	5 50	
C. Trow	23 25	
K. H. Van Norman	35 00	
D. J. G. Wishart	23 25	
A. H. Wright	73 50	
A. H. Adams (presiding)	39 00	
M. H. V. Cameron (presiding)	39 00	
J. H. McPhedran (presiding)	39 00	
J. A. Oille (presiding)	1 50	
W. H. Piersol (presiding)	37 50	
W. Scott (presiding)	39 00	
G. E. Smith (presiding)	18 00	
J. Low (attendant)	9 00	
J. C. McMurray (attendant)	7 50	
D. Main (attendant)	18 50	
T. D. Park (attendant)	16 50	
J. B. Paulin (attendant)	12 00	
		$2,620 25

Engineering and Applied Science:

F. B. Allan	$6 00	
G. R. Anderson	208 05	
R. W. Angus	194 50	
E. G. R. Ardagh	61 60	
J. W. Bain	152 30	
A. Baker	124 15	
F. Barber	21 85	
W. Barber	4 00	

10. *Examinations.*—Continued.

B. A. Bensley	$5 80	
W. C. Blackwood	30 80	
M. C. Boswell	35 95	
T. W. Brown	31 00	
J. R. Cockburn	172 60	
A. P. Coleman	79 25	
C. A. Chant	22 25	
A. G. Creighton	10 60	
S. R. Crerar	15 35	
A. T. De Lury	6 25	
S. Dushman	11 00	
W. H. Ellis	121 90	
J. H. Faull	5 80	
S. L. Fear	10 00	
G. H. Ferguson	18 35	
J. C. Fields	72 00	
H. S. Fierheller	6 10	
C. C. Forward	11 45	
J. Galbraith	28 21	
P. Gillespie	197 99	
W. W. Gray	26 30	
W. F. Greene	29 22	
W. Huber	10 00	
J. D. Keppy	10 00	
A. T. Laing	10 30	
H. M. Lancaster	25 95	
J. McGowan	108 85	
W. McKinnon	10 00	
N. B. McLean	67 25	
G. R. Mickle	109 10	
W. Lash Miller	45 75	
J. G. Parker	6 25	
W. A. Parks	16 40	
A. L. Parsons	63 78	
G. W. Paterson	21 90	
H. W. Price	64 35	
M. R. Riddell	29 00	
T. R. Rosebrugh	146 70	
T. E. Rothwell	21 40	
H. G. Smith	29 35	
L. B. Stewart	234 40	
J. J. Traill	8 30	
W. M. Treadgold	23 50	
A. E. Uren	10 00	
E. Wade	6 35	
T. L. Walker	54 25	
C. H. C. Wright	266 35	
		$3,120 10
Household Science:		
J. A. Amyot	$12 00	
Miss C. C. Benson	12 13	
A. G. Huntsman	2 87	
Miss A. L. Laird	35 50	
J. C. McLennan	5 50	
A. B. Macallum	12 12	
R. B. Thomson	2 88	
		$83 00
Pedagogy:		
J. G. Hume	$5 25	
F. W. Merchant	10 50	
F. Tracy	5 25	
		$21 00
Law:		
A. W. Briggs	$60 25	
A. R. Clute	65 50	
		$125 75

10. *Examinations.*—Continued.

Dentistry:		
E. C. Abbott	$23 50	
H. A. Clark	13 25	
F. A. Clarkson	20 75	
G. G. Hume	13 25	
J. McPherson	13 25	
W. A. Piper	5 75	
R. J. Reade	12 50	
C. B. Shuttleworth	27 75	
G. Silverthorne	12 50	
W. C. Trotter	43 50	
A. H. Adams (presiding)	15 00	
D. S. Dix (attendant)	7 00	
J. Hill (attendant)	7 50	
H. H. McDiarmid (attendant)	3 00	
J. McEachern (attendant)	7 50	
H. R. Pickup (attendant)	7 50	
W. V. Tilley (attendant)	10 50	
		$244 00
Pharmacy:		
G. Chambers	$24 00	
C. F. Heebner (including expenses, $46.29)	94 29	
A. Moir	24 00	
P. Scott	24 00	
G. J. Blewett (presiding)	15 00	
J. G. Miller (attendant)	7 50	
D. Sinclair (attendant)	5 00	
		$193 79
Music:		
J. E. P. Aldous (including expenses, $10.75)	$68 95	
J. Humphrey Anger	20 58	
E. Broome	15 00	
W. E. Fairclough	37 58	
W. O. Forsyth (including expenses, $11.95)	41 95	
A. Ham	61 50	
C. L. M. Harris (including expenses, $36.20)	79 28	
J. W. F. Harrison (including expenses, $10.45)	52 45	
St. John Hyttenrauch (including expenses, $13.90)	43 90	
T. Martin (including expenses, $200.00)	270 70	
R. S. Pigott	15 00	
E. W. Schuch (including expenses, $2.15)	12 15	
R. Tandy	10 00	
J. D. A. Tripp	73 50	
A. S. Vogt (including expenses, $26.75)	113 35	
F. S. Welsman (including expenses, $18.00)	111 15	
W. H. Ballard (presiding: expenses, $6.55)	14 55	
W. A. Bradley (presiding: expenses, $3.75)	5 75	
J. A. Clark (presiding)	2 50	
R. Davidson (presiding)	3 00	
T. Eakin (presiding)	8 00	
T. E. Elliott (presiding: expenses, $1.10)	3 60	
J. C. Harstone (presiding)	5 00	
J. Henderson (presiding)	7 00	
Mrs. C. Horne (expenses)	25	
G. L. Johnston (presiding: expenses, 30c.)	5 30	
J. W. Macmillan (presiding: expenses, $3.70)	8 70	
F. W. Merchant (presiding: expenses, 25c.)	8 25	
W. H. Murch (presiding: expenses, $32.00)	37 00	
W. N. Ponton (presiding: expenses, $1.25)	3 75	
H. J. Robertson (presiding)	2 00	
Miss L. Salter (presiding)	10 50	
J. R. Stone (presiding)	2 50	
J. C. Tolmie (presiding)	5 00	
Mrs. A. Watt (presiding: expenses, $4.00)	9 00	
		$1,168 69

10. *Examinations.*—Continued.

Agriculture:

W. J. Alexander	$10 50	
H. S. Arkell (including expenses, $2.00)	55 50	
C. J. S. Bethune	18 00	
W. H. Day	41 00	
H. H. Dean	31 50	
S. F. Edwards	30 75	
W. P. Gamble (including expenses, $3.10)	85 35	
H. L. Hutt (including expenses, $2.50)	37 00	
T. B. Jarvis (including expenses, $1.55)	22 55	
S. B. McCready	65 50	
J. B. Reynolds (including expenses, $2.55)	23 55	
Miss A. G. Rowsome	15 50	
C. A. Zavitz	17 75	
E. J. Zavitz	9 75	
G. G. White (presiding: expenses, $1.00)	35 50	
		$499 70

(*b*) Stationery and Supplies:

University Press	$779 34	
Hutchison & Coy., parchments	332 00	
Brown Bros., binders	121 75	
Henry Frowde, books	12 84	
Students' Book Department, books	2 62	
R. M. Williams, diplomas	4 00	

Rent of pianos and rooms:

Gourlay, Winter & Leeming	$18 00		
C. W. Kelly	5 00		
Forbes D. Wilson	5 00		
W. P. Blair	4 00		
Miss M. L. Smith	3 00		
Miss C. McKenna	3 00		
Denison & Elliott	1 00		
		39 00	
C. M. Richardson, cartage		32 50	
Doane Bros., cab hire		11 50	
			$1,335 55

(*c*) Printing Examination Papers and Class Lists:

University Press	$2,633 44	
		2,633 44
		$18,585 16

11. *Advertising.*

Alumni Association, annual grant	$200 00	
Alumni Association, advertising in University Monthly	100 00	
Westminster Coy., advertisement	20 00	
Toronto Globe, advertisements	55 80	
Toronto Mail and Empire, advertisements	55 80	
Toronto World, advertisements	33 00	
The Times, England, advertisement	15 54	
"Torontonensis," advertisement	15 00	
"Varsity," advertisement	15 00	
Montreal Star, advertisement	18 90	
MacMillan & Coy., advertisement in "Science" and "Nature"	14 47	
Trinity Year Book, advertisement	12 50	
News Publishing Coy., advertisement	11 70	
St. Andrew's College Review, advertisement	10 00	
Star Printing and Publishing Coy., advertisement	9 00	
Copp, Clark Coy., advertisement in Canadian Almanac	7 50	
The Guide, Port Hope, advertisement	3 00	
Canadian Contract Record, advertisement	2 50	
		$599 71

12. *Incidentals.*

R. M. Williams, engrossing resolutions	$29 50	
A. H. Howard, engrossing resolutions	125 00	
Rolph, Clark Coy., engraving medals	10 50	
A. J. Reading, photo work and slides	57 50	
University Rifle Association per Prof. DeLury, Railway fares, Ottawa and return	47 10	
Toronto Weekly Railway and Steamboat Guide	5 20	
University Press, sundry printing	9 00	
Toronto Fire Department, services of firemen	12 00	
		$295 80

13. *Library.*

(*a*) Maintenance of Building:		
Ellias Rogers Coy., fuel	$547 28	
City Treasurer, water	29 69	
Mrs. Long, cleaning	175 00	
Polson Iron Works, repairs to boiler	17 68	
G. Duthie & Sons, repairs to roof	10 68	
W. J. McGuire & Coy., repairs to plumbing	1 63	
Office Specialty Mfg. Coy., desks	44 00	
Adams Furniture Coy., chairs	20 00	
Le Page Door Check Coy., spring	12 00	
Aikenhead Hardware Coy., screws, etc	1 16	
J. Langmuir & Coy., floor oil	2 05	
E. B. Eddy & Coy., toilet paper	5 40	
Mrs. Fussell, washing towels	12 45	
		$879 02
(*b*) General Library Appropriation, Books and Periodicals:		
F. A. Brockhaus	$3,602 66	
C. D. Cazenove & Son	1,979 01	
Students' Book Department	747 12	
G. Fock	692 36	
W. H. Guild & Coy	279 28	
H. Le Soudier	393 07	
Max Weg	385 94	
Gauthier-Villars	51 68	
B. Seeber	32 11	
University of Pennsylvania	30 30	
Actuarial Society of America	29 35	
Harry H. Peach	26 00	
G. N. Morang & Coy.	25 00	
R. B. Thomson	23 53	
University of Chicago Press	23 58	
W. H. Lowdermilk & Coy	15 10	
Kimball Bros	14 71	
Charles Scribner's Sons	13 89	
R. Friedländer & Sohn	10 90	
R. Merkel	10 10	
J. B. Lippincott & Coy	10 06	
Ulrico Hoepli	9 75	
Spanish American Book Coy	6 06	
Canada Law Book Coy	5 50	
B. Login & Son	5 03	
K. W. Hierseman	11 84	
Canada Law Review	5 00	
Mrs. Chamberlain	4 00	
Johns Hopkins Press	3 74	
Prof. A. T. De Lury	3 75	
American Lumberman	3 53	
J. Baer & Coy	3 47	
John Britnell	3 35	
Dr. N. E. Dionne	3 28	
Annual Review Publishing Coy	3 25	
Superintendent of Documents, Washington	3 03	
Canadian Mining Review	3 00	

13. *Library.*—Continued.

Prof. G. M. Wrong		$3 00	
Librarie Beauchemin		2 80	
McGill University Library		2 74	
Ontario Publishing Coy		2 50	
H. Welter		2 46	
National Geographic Society		2 03	
"Torontonensis," 1906		2 00	
Ontario Library Association		2 00	
H. S. Bardal		2 00	
Bangel & Schmitt		1 70	
Daily Telegraph		1 57	
N. J. Bartlett & Coy		1 56	
Pierre Georges Roy		1 25	
Albert Britnell		1 25	
Union Library Association, N.Y.		1 11	
Canadian Electrical News		1 00	
"Varsity"		1 00	
Canada Lumberman		1 00	
American Forestry Association		1 00	
Thompson, Pitt Book Coy		90	
A. Owen & Coy		66	
Paul Ollendorff		60	
L'Abbé Casault		60	
Might Directories, directory		6 00	
Brown Bros., binding		460 85	
Bryant Press, binding		171 22	
William Briggs, binding		96 84	
Robinson & Heath, freight		209 75	
Copeland, Chatterson Coy., register		18 89	
Library Bureau, card catalogue cases		6 00	
Hammond Typewriter Coy., supplies and repairs		6 68	
United Typewriter Coy., supplies		2 00	
A. J. Reading, making negative		1 25	
Rice Lewis & Son, book supports, etc		55 25	
Grand & Toy, stamp box		60	
C. Gripton, repairing date stamp		1 50	
G. McMurrich, appraisement		3 00	
The Librarian, petty disbursements		100 00	
The Librarian, Library grant towards University Studies		300 00	
University Press, stationery and printing		162 56	
		$10,112 45	
Less chargeable to Library Insurance Fund.	$2,027 33		
Less chargeable to Library Restoration Fund	100 00		
Less received for books sold	31 00		
		2,158 33	
			$7,954 12
(c) Clerical Assistance:			
Miss F. E. Brown		$35 00	
Miss E. Creighton		96 30	
Miss A. Baines		86 30	
			$217 60
			$9,050 74

14. *Museum.*

C. T. Currelly, Collector of Archaeological remains, 11 months' salary	$916 66	
C. T. Currelly, for purchase of Archaeological specimens	1,500 00	
Canadian Bank of Commerce, freight on antiquities	183 41	
Bank of British North America, freight on antiquities	44 88	
William Harper, freight, etc.	73 87	
		$2,718 82

15. *Gymnasium and Students' Union.*

Elias Rogers Coy., fuel		$574 94	
City Treasurer, water		163 11	
Consumers' Gas Coy., gas	$100 26		
Less paid by Students' Societies	40 49		
		59 77	
Mrs. Wood, cleaning		53 13	
Polson Iron Works, repairs to boiler		23 85	
R. Robertson, repairs to boiler		4 98	
W. J. McGuire & Coy., repairs to plumbing		6 35	
Wheeler & Bain, repairing trough		4 68	
Wm. Cane, repairs to gymnasium appliances		30 75	
R. Dinnis & Son, carpentry		9 14	
G. Pearsall, repairing tools		7 20	
Alliance Francais, platform		20 00	
Rice Lewis & Son, netting, etc		7 40	
H. H. Love & Coy., gymnasium appliances		147 00	
University Press, toilet paper		9 05	
G. Hare, paid fireman during illness of Caretaker		10 00	
Athletic Association, services of boy		192 50	
		$1,323 85	
Less students' fines for damages to property		94 00	
			$1,229 85

16. *Grounds.*

R. Robertson, roadway, grading, etc	$997 45	
John McDonald, gravel	297 00	
W. Booth Lumber Coy., lumber	328 38	
R. Dinnis & Son, lumber	11 06	
C. D. McDonald, trees	38 00	
R. B. Thomson, superintendence of tree pruning	18 00	
Steele, Briggs Seed Coy., seeds, etc	88 50	
John Cotterill, flowers	445 22	
James Woods, sod	9 10	
G. B. Meadows Coy., wire fencing	22 88	
Page Wire Fence Coy., guards for flower beds	18 60	
Athletic Association, horse hire	55 00	
Rice Lewis & Son, hardware	5 66	
George Pearsall, sharpening tools, etc	16 65	
Wm. Cane, carpentering, etc	45 00	
T. A. Ovens, painting flag pole, etc	71 00	
Toronto Electric Light Coy., moving poles	21 43	
Carbon Light & Power Coy., rent of lamp	2 04	
J. S. Cann, fencing	15 00	
M. McBain, uniforms for Constable	34 10	
Wreyford & Coy., Constable's helmet	1 75	
Chief of Police, services of constables	6 00	
The Bursar, fortnightly pay lists, laborers and policeman	2,342 70	
New granolithic walks, balance outstanding from last year	500 00	
		$5,390 52

17. *Main Building.*

R. Robertson, repairs to brickwork, boilers, etc	$181 81
T. A. Ovens, painting, glazing, etc	839 99
Jos McCausland & Son, glazing, etc	2 28
Forbes Roofing Coy., repairs to roof	212 86
W. J. McGuire & Coy., repairs to plumbing	336 29
Wheeler & Bain, repairs to eavestroughs, etc	55 61
W. H. Fox, repairs to motors	2 00
Bennett & Wright, repairing clock	9 20
Orr & Membery, nickleplating	1 75
George Menzies, carpentry work	166 95
H. Salmon, upholstering, repairs, etc	8 50
Wm. Cane, repairs, keys, etc	39 30
Fletcher Mfg. Coy., ladders, hardware, etc	35 85
Central Electric & School Supply Coy., electric supplies, etc.	184 50

17. *Main Building.*—Continued.

Toronto Electric Light Coy., electric supplies	$13 25	
R. Dinnis & Son, lumber, etc	562 87	
J. G. Scott Coy., lumber, etc	179 08	
Adams Furniture Coy., chairs	160 00	
R. Simpson Coy., furnishings and supplies, etc	289 16	
Rice Lewis & Son, hardware	85 26	
Aikenhead Hardware Coy., hardware	52 27	
Stewart & Wood, varnish, etc	27 82	
James Morrison Brass Mfg. Coy., valves, etc	16 33	
Steinberger, Hendry Coy., blackboards, etc	19 44	
W. A. Murray Coy., Ltd., screens, etc	10 25	
John Kay, Son & Coy., table	22 50	
G. McFarlane, ladder	10 90	
McDonald & Willson, gas range	6 48	
Beardmore Belting Coy., engine belt, etc	81 00	
G. W. Grant, oil, etc	25 30	
Toronto Plate Glass Coy., glass	4 83	
Rhodes' Metallic Packing Coy., packing	8 00	
India Alkali Coy., cleaning material	17 05	
T. Eaton Coy., cleaning material	17 00	
Tolton & Macintosh, box opener	1 50	
Grand & Toy, baskets	2 60	
J. J. Follett, cloth for lantern frames	10 35	
Michie & Coy., Ltd., mineral water	4 20	
C. M. Richardson, cartage	9 75	
University Press, toilet paper	40 37	
Mrs. Laballister, washing towels	82 80	
J. C. McMurray, occasional cleaning	40 00	
H. J. Ingram, electrician's services	104 72	
J. Rossall, fireman's services, night work	37 50	
R. Martin, car fares for messenger	2 85	
G. E. Grove, repairing messenger's bicycle	7 10	
Elias Rogers Coy., fuel	4,038 60	
City Treasurer, water	280 44	
Toronto Electric Light Coy., electric current	1,193 53	
Consumers' Gas Coy., gas	103 47	
		$9,645 46

18. *Biological Building and Department.*

(*a*) Maintenance of Building:		
Elias Rogers Coy., fuel	$1,247 52	
Consumers' Gas Coy., gas	90 50	
Toronto Electric Light Coy., electric current	200 03	
City Treasurer, water	95 62	
Furnishings and Cleaning Materials:		
Fletcher Mfg. Coy., house-furnishings, etc	24 30	
John Kay, Son & Coy., carpet, etc	57 41	
Toronto Electric Light Coy., shades	7 50	
Ironsides Gas Mantle Coy., gas mantles	1 95	
G. & J. Murray, lights	2 25	
John Catto & Son, towelling, etc	19 75	
Sanderson Pearcy & Coy., cleaning materials	9 91	
Imperial Chemical Coy., cleaning materials	12 50	
National Drug & Chemical Coy., cleaning materials	4 50	
Aikenhead Hardware Coy., hardware	36 91	
Charles Rogers & Sons Coy., cupboards	28 00	
Canadian Office Coy., seats	18 00	
Remington Typewriter Coy., supplies	3 00	
University Press, paper, etc	36 86	
Prof. Wright, disbursements	49 22	
Repairs:		
Bennett & Wright, repairing plumbing	60 52	
Wheeler & Bain, tinsmithing	5 24	
G. B. Meadows, repairing iron-work	18 45	
Polson Iron Works, boiler repairs	10 44	
R. Robertson, boiler repairs	18 54	

18. *Biological Building.*—Continued.

James Morrison Brass Mfg. Coy., valves	$1 83	
R. Rennie & Son, repairing roof	7 76	
Geo. Duthie & Son, repairing roof	98 44	
Otis Fensom Coy., adjusting elevator	5 30	
Toronto Electric Light Coy., repairs to wiring, etc	16 23	
Elliott & Son, numbering chairs, etc	22 63	
R. Dinnis & Son, lumber, etc	217 93	
Aikenhead Hardware, hardware	16 40	
Sanderson Pearcy & Coy., paint, etc	154 82	
H. C. Appleton, carpentering, etc	178 56	
Pay lists, wages of painters	220 96	
Converting part of basement into Laboratory:		
R. Robertson, brickwork, etc	799 44	
Bennett & Wright Coy., plumbing	97 34	
Toronto Electric Light Coy., wiring, etc	101 66	
Cleaning and Messenger Service:		
Mrs. Clark, charwoman	140 00	
Prof. Wright to pay sundry cleaners	208 80	
Prof. Wright to pay messengers	195 00	
		$4,542 02

(*b*) Maintenance of Department:

Laboratory Supplies:		
Chandler, Ingram & Bell, chemicals, etc	$63 74	
Schering & Glatz, chemicals, etc	9 64	
National Drug & Chemical Coy., chemicals	2 20	
Warmbrunn, Quilitz & Coy., chemicals	10 31	
Central Electric Coy., jars	1 80	
J. Coulter & Coy., boxes	16 00	
Freysing Cork Coy., corks	2 70	
J. G. Ramsey & Coy., photo materials	54 40	
Lockhart Photo Supply Coy., photo material	7 85	
H. F. Sharpe Coy., photo supplies	2 90	
James Iredale, vessel	50	
Bausch & Lomb Coy., knife	1 00	
Canadian General Electric Coy., carbons	1 55	
Toronto Electric Light Coy., supplies	1 50	
John Catto & Son, cotton, etc	8 26	
R. Knowles, feed	2 90	
T. S. Plaskett, bracket	3 35	
Robinson & Heath, freight, etc	9 10	
Students' Book Department, books	12 50	
Friedlander & Son, books & diagrams	28 91	
G. Fischer, books & diagrams	8 52	
Journal of Experimental Zoology, subscription	5 03	
R. A. E. Jackson, work on diagrams	27 80	
University Press, printing, etc	22 94	
Bell Telephone Coy., long distance message	1 75	
Prof. Wright, petty disbursements	65 97	
Museum Specimens:		
W. Schluter, specimens	120 00	
Paul Osterloh, specimens	100 00	
John Russell, specimens	50 80	
Major Hodgins, specimens	35 00	
W. F. Webb, specimens	9 50	
Ward's Natural Science Establishment, specimens	23 40	
John Maughan, Jr., mounting	33 50	
Prof. Wright, disbursements	27 71	
Museum Supplies and Cases:		
Warmbrunn, Quilitz & Coy., jars and glassware	307 69	
Dr. H. H. Field, Zoological cards	335 00	
P. Wytsman, museum supplies	60 07	
Friedländer & Sohn, book	2 06	
Charles Rogers & Son Coy., cases	402 60	
Elliott & Son, glass	29 65	
G. B. Meadows, locks, etc	29 75	
Aikenhead Hardware, hardware	16 60	

18. *Biological Building.*—Continued.

J. Iredale, brackets	$5 65	
Fletcher Mfg. Coy	6 00	
J. Wicksey, box	1 75	
C. W. Irwin, freight, etc	36 88	
Robinson & Heath, freight, etc	14 14	
Prof. Wright, petty disbursements	3 50	
Marine and Lake Laboratories:		
Dr. B. A. Bensley, expenses	86 16	
J. R. G. Murray, expenses	50 00	
P. M. Bayne, expenses	60 00	
W. B. Scrimgeour, expenses	60 00	
Students' Laboratory Supplies:		
J. Iredale, copper tanks	281 75	
Bausch & Lomb, glassware, etc	292 54	
J. Stewart & Son Coy., lifters	31 25	
J. A. Carveth, microscope boxes	39 00	
J. J. Dickson, frogs	45 00	
J. F. Mackey, frogs	5 10	
Dr. Piersol, frogs	6 45	
G. Hope & Son, rabbits	13 90	
W. E. Miller, dog fish	14 10	
Marine Biological Laboratory, sea-weed	12 75	
R. Knowles, feed	2 75	
J. A. Simmers, seeds	2 10	
National Drug & Chemical Coy., chemicals	39 39	
Inland Revenue Department, methylated spirits	74 23	
J. Catto & Son, cotton, etc	32 85	
W. Croft & Sons, pins, etc	2 77	
Chandler, Ingram & Bell, sundries	8 04	
J. Wicksey, box	3 50	
H. C. Appleton, carpentry	334 65	
University Press, stationery and printing	186 69	
W. A. McCubbin, preparation of material	50 00	
Robinson & Heath, freight, etc	6 01	
Professor Wright, disbursements	20 38	
Microscopes:		
E. Leitz, microscopes	753 06	
Robinson & Heath, freight, etc	18 34	
Professor Wright, disbursements	8 39	
	$779 79	
Less received from sales of old microscopes	180 00	
	$599 79	
Specimens, Vertebrate Palaeontology:		
Dr. B. A. Bensley, advance for expenses of collection...	1,000 00	
Catalogue Preparation:		
J. B. Williams, 10 months' work	500 00	
Office Assistance:		
Miss Ethel Smith, 48 weeks	239 00	
		$6,125 52
(c) Sub-Department of Botany:		
Apparatus:		
Bausch & Lomb Coy., apparatus	$109 84	
Carl Zeiss, apparatus	146 51	
Spencer Lens Coy., apparatus	20 19	
H. J. Green, apparatus	6 36	
Eimer & Amend, apparatus	11 20	
R. Dinnis & Son, oak case	74 00	
G. & J. Murray, lamp, etc	5 90	
Toronto Electric Light Coy., electrical work	14 60	
T. S. Plaskett, repairs	1 25	
Chandler, Ingram & Bell	7 91	
Robinson & Heath, freight	2 97	
C. W. Irwin, freight	1 50	

18. *Biological Building.*—Continued.

Herbarium:		
James Lomax, specimens	$37 11	
Henry Sydow, specimens	15 15	
Cambridge Botanical Supply Coy., supplies	6 76	
F. S. Collins, material	10 06	
E. W. D. Hollway, material	2 03	
G. W. Wilson, material	2 03	
A. B. Seymour, book	3 10	
A. J. Grant, book	15 10	
E. Bartholomew, book	12 12	
Paul Klincksieck, Icone Mycologicae	112 75	
A. J. Dinsmore, cases	69 00	
Rice Lewis & Son, plate	4 20	
R. Dinnis & Son, carpenter work	41 05	
C. W. Irwin, freight, etc	3 00	
University Press, printing	31 84	
Professor Wright, disbursements	6 44	
Museum Cases and Supplies:		
Canada Cabinet Coy., cases	744 50	
Aikenhead Hardware Coy., hardware	9 31	
James Iredale, tanks	65 00	
Toronto Plate Glass Importing Coy., glass	164 00	
Elliott & Son, glass	12 95	
W. Shackleton, dishes, etc	23 50	
F. Krantz, museum collection	299 22	
I. E. Tilden, specimens	105 75	
Marine Biological Laboratory, sea-weed	25 10	
Brown Milling Coy., wheat	3 45	
National Drug & Chemical Coy., chemicals	10 80	
Chandler, Ingram & Bell, chemicals	33	
A. J. Dinsmore, block	2 35	
Cambridge Botanical Supply Coy., slides	2 28	
Sherratt & Hughes, book	5 39	
Ontario Rubber Coy., gloves	1 50	
C. W. Irwin, freight, etc	9 05	
University Press, printing	82	
R. B. Thomson, petty sundries	4 27	
Assistance in Museum and Herbarium:		
C. G. Fraser, classifying specimens	188 00	
William Phillips, unpacking specimens	9 60	
Miss Ryerson, occasional assistance	61 00	
J. H. White, occasional assistance	40 00	
		$2,562 14
		$13,229 68

19. *Physiological Department.*

Vereinigte Fabriken, apparatus, etc	$253 31	
J. A. Carveth & Coy., apparatus, etc	200 00	
C. Reichert, apparatus, etc	177 04	
Owen Ballard, apparatus, etc	90 25	
Harvard Apparatus Coy., apparatus, etc	77 55	
J. Hawksley, apparatus, etc	22 40	
F. Köhler, apparatus, etc	20 33	
Charles Potter, apparatus, etc	4 00	
Eimer & Amend, laboratory supplies	62 19	
Chandler, Ingram & Bell, laboratory supplies	13 84	
Queen & Coy., laboratory supplies	10 06	
Kny-Scheerer Coy., laboratory supplies	12 63	
Fletcher Mfg. Coy., laboratory supplies	30 75	
Central Electric Coy., laboratory supplies	49 66	
Ontario Rubber Coy., laboratory supplies	62 36	
Lyman Bros., chemicals	46 52	
Merck & Coy., chemicals	18 61	
Beaver Flint Glass Coy., tubes	3 65	
H. L. Cox, tubes	65	
Toronto Salt Works, salt	75	
Freyseng Cork Coy., corks	4 91	

19. *Physiological Department.*—Continued.

Lake Simcoe Ice Coy., ice	$0 90	
A. J. Reading, slides	4 80	
J. A. Fontaine, frogs	89 90	
J. J. Dickson, frogs	22 50	
George Meech, supplies	4 08	
Booth Copper Coy., vacuum kettle, etc	47 50	
J. J. Wilson, copper cabinet	79 50	
Canadian General Electric Coy., lamp, etc	90	
T. Eaton Coy., furnishings, etc	100 37	
McKenzie & Coy., frames	12 95	
Duncan Bros., frames	6 90	
A. Pride, diagrams	13 00	
Students' Book Department, books	102 10	
Archivio di Fisiologia, subscription	4 96	
University Press, printing, etc	76 29	
Robinson & Heath, freight, etc	66 14	
A. T. Reed, cartage charges	79	
V. E. Henderson, petty sundries	9 18	
Maintenance, Medical Building, share due by Physiological Department	2,500 00	
		$4,304 22
Less paid by Dr. Benson from students' account		39 53
		$4,264 69

20. *Chemical Building and Department.*

(*a*) Maintenance of Building:		
Elias Rogers & Coy., fuel	$657 56	
Consumers' Gas Coy., gas	4 15	
Toronto Electric Light Coy., electric current	269 53	
City Treasurer, water	104 76	
Mrs. Repath, cleaning	99 00	
Repairs and Incidentals:		
R. Farthing, carpenter work, etc	251 84	
Aikenhead Hardware, hardware	105 53	
Harrison & Robertson, plumbing and repairs	52 65	
Charles Robertson, plumbing and repairs	83 85	
R. W. Harrison, plumbing and repairs	6 95	
W. J. McGuire & Coy., smoke test	6 70	
Charles Reeve, painting, etc	16 50	
G. E. Grove, repairing lawn mower	1 00	
J. A. Darch & Coy., repairs	1 00	
Douglas Bros., repairs	5 00	
Fletcher Mfg. Coy., furnishings and sundries	70 25	
R. A. L. Gray, electrical supplies	56 65	
James Morrison Brass Coy., sundries	16 13	
Robert Simpson Coy., rug, etc	17 50	
T. G. Rice, mat	7 00	
G. R. Plumb, registers	6 25	
William Cane, locks	1 50	
Tolton & McIntosh, case opener	1 50	
C. F. Good, soap, brushes, etc	21 50	
Mrs. Repath, washing towels	24 85	
G. Donkin, window cleaning	37 50	
E. Repath, rubber stamps	2 40	
		$1,929 05
(*b*) Maintenance of Department:		
Eimer & Amend, chemicals, and laboratory supplies	$1,095 96	
Lyman Bros. & Coy., chemicals and laboratory supplies.	220 07	
Baird & Tatlock, chemicals and laboratory supplies	107 20	
Estate late Russell-Duncan, chemicals and laboratory supplies	51 71	
Thomson, Skinner & Hamilton, chemicals and laboratory supplies	57 87	
Weston Electrical Instrument Coy., repairs	4 69	
Beaver Flint Glass Coy., test tubes, etc	80 35	
Dominion School Supply Coy., supplies	4 64	

20. *Chemical Building.*—Continued.

Brown Bros., supplies	$3 75	
Fletcher Mfg. Coy., supplies	34 75	
Ontario Rubber Coy., tubing, etc	90 03	
Freyseng Cork Coy., corks	27 45	
R. W. Hollinger, salt, etc	3 35	
James Morrison Brass Coy., sundries	2 06	
A. Jeffrey, sundries	55	
Aikenhead Hardware Coy., hardware	6 07	
C. W. Irwin, freight, etc	34 03	
United Typewriter Coy., stationery	95	
University Press, stationery and printing	43 67	
Professor Lang, petty disbursements	18 64	
Professor Miller, petty disbursements	9 49	
Kny-Sheerer Coy., new balances	277 62	
C. W. Irwin, entry fee, etc	14 45	
		$2,189 85
Physical-Chemistry Sub-Department:		
Eimer & Amend, apparatus, etc	$310 71	
Squibb & Son, alcohol	28 45	
Roessler & Hasslacher, Chemical Co., chemicals	2 03	
Fletcher Mfg. Co., gasometer, etc	27 50	
Dominion School Supply Co., triangle	1 20	
Lyman Bros. & Co., chemicals	25 35	
Toronto Liquid Carbon Co., gas	2 00	
United Typewriter Co., supplies	2 95	
Lake Simcoe Ice Co., ice	15 30	
C. W. Irwin, express and brokerage	6 39	
Aikenhead Hardware Co., hardware	4 47	
R. W. Harrison, plumbing	9 50	
J. W. Geddes, framing	5 25	
L. Rawlinson, cupboard	32 50	
T. G. Rice Wire Mfg. Co., screening	8 70	
University Press, stationery	10 38	
R. H. Clark, petty supplies	3 80	
R. B. Stewart, petty supplies	3 36	
		$2,689 19
Less paid by Professor Lang from Students' account		250 00
		$2,439 19
		$4,368 24

21. *Physical Department.*

Maintenance:		
Central Electric and School Supply Co., supplies	$322 67	
Ontario Rubber Co., supplies	41 53	
William Blaikie, brass castings	16 00	
Aikenhead Hardware Co., hardware	170 64	
Wheeler & Bain, supplies, etc	40 10	
Eimer & Amend, chemicals, etc	122 47	
Merck & Co., chemicals, etc	10 39	
James Morrison Brass Manufacturing Co., supplies	20 09	
Queen City Plate Glass Co., glass	7 72	
Art Metropole, supplies	13 66	
Lyman Bros. & Co., chemicals, etc	144 27	
Toronto Plate Glass Co., glass	1 39	
Canada Process Co., gas	10 50	
Charles Potter, gas	13 25	
Dominion Carbonic Co., gas	11 50	
Toronto Liquid Carbon Co., gas	4 00	
Whaley, Royce & Co., supplies	1 50	
Students' Book Department, books	52 75	
Canada Metal Co., supplies	4 87	
Brown & Sharpe Mfg. Co., supplies	8 08	
The Scientific Shop, tubes	2 54	
E. Harris Co., turpentine	30	
W. G. Pye & Co., wire, etc	18 34	
McGregor & McIntyre, iron frame	6 10	

21. *Physical Department.*—Continued.

Toronto Salt Works, salt	$4 00	
Brown Bros., invoice book	2 00	
Geo. J. Beattie, electrical supplies	16 42	
Treloar, Blashford Co., castings	5 04	
P. W. Ellis & Co., agates	1 00	
Leeds & Northrup Co., wire	17 15	
Richard Muller-Uri, supplies	8 11	
J. P. Mill, engraving	1 45	
G. & J. Murray, oil	2 60	
Canadian General Electric Co., carbons	64	
Vokes Hardware Co., varnish, etc	1 70	
Grand & Toy, supplies	4 25	
Hall & Sons, fire clay crucible	8 36	
M. A. Seed Dry Plate Co., films	1 51	
Fiddes & Hogarth, lead	1 20	
Toronto Silver Plate Co., castings, etc	2 00	
J. G. Ramsey & Co., photo supplies	30 80	
Rice Lewis & Son, supplies	3 52	
C. W. Irwin, freight charges, etc	25 28	
B. Cairns, rubber stamp	90	
Bausch & Lomb Optical Co., tubes, etc	10 16	
Fletcher Mfg. Co., stove	2 50	
Reid & Brown, casting	1 00	
Robert Simpson Co., oil cloth	11 26	
Canadian Rubber Co., supplies	1 05	
W. F. Maas, paint and oil	1 70	
F. P. Jeffery, engraving	5 50	
R. Dinnis & Son, carpentry	3 23	
Mackenzie & Co., framing	4 00	
American Tent & Awning Co., stool	50	
Office Specialty Manufacturing Co., supplies	9 32	
E. Rogers Co., coke	1 75	
Milnes Coal Co., coke	1 75	
Lake Simcoe Ice Co., ice	42 80	
C. M. Richardson, cartage	2 25	
Frazee Storage Co., cartage	1 00	
University Press, printing, etc	131 85	
George Menzies, cases	11 20	
A. T. Reed, typewriting	23 17	
Dr. J. C. McLennan, petty disbursements	44 70	
W. J. Loudon, petty disbursements	2 80	
		$1,496 08

New Apparatus:

Central Electric & School Supply Co., electrical apparatus	$27 31	
Canadian General Electric Co., apparatus	33 32	
Keller & Co., N.Y., lenses	10 85	
Chandler & Massey, fans	10 00	
Wheeler & Bain, apparatus	32 22	
Bausch & Lomb Optical Co., apparatus	58 09	
C. H. Stoelting Co., apparatus	45 55	
Robert W. Paul, apparatus	19 44	
L. Golaz, Paris, thermometers	20 51	
A. T. Thompson & Co., lantern, etc	135 25	
W. G. Pye & Co., apparatus	336 43	
A. Hilger, apparatus	63 34	
Eimer & Amend, apparatus	99 00	
R. Muller-Uri, apparatus	205 05	
Spindler & Hoyer, apparatus	70 05	
Cambridge Scientific Instrument Co., apparatus	93 04	
Scientific Shop, apparatus	12 19	
P. W. Ellis & Co., wire	14 38	
Vereinigte Fabriken, apparatus	33 95	
Societe Genevoise, apparatus	24 43	
F. E. Becker & Co., apparatus	15 23	
Carl Zeiss, apparatus	33 73	
Lyman Bros. & Co., mercury	53 55	

21. *Physical Department.*—Continued.

Cohen Bros., square	$3 60	
Johnson, Matthews Co., apparatus	20 82	
Wm. Gaertner & Co., apparatus	92 65	
John Wanless & Co., stop watches	13 50	
T. Carpentier, apparatus	127 20	
Robert N. Ahern, calculating machine	325 00	
Max Kohl, rheostat	30 80	
C. Potter, thermometers	10 00	
O. L. Petitdidier, mirrors	58 15	
Gurney Foundry Co., mica	17 72	
Wm. Blaikie, castings	2 80	
R. Dinnis & Son, Ltd., top	20 16	
J. S. Hanson, chemicals	1 80	
J. J. McLaughlin, gas tube	3 90	
W. & J. Greey, zinc	3 78	
Galloway, Taylor & Co., casting	1 54	
Vokes Hardware Co., balances	1 00	
C. W. Irwin, freight charges, etc	125 51	
A. J. Reading, slides	8 40	
Whaley, Royce Co., bows and metronome	7 50	
United Typewriter Co., typewriter	120 00	
Office Specialty Co., card sections	56 00	
		$2,498 74
		$3,994 82

22. *Mineralogical and Geological Department.*

(a) Mineralogy:

Apparatus:		
J. J. Griffin & Sons, apparatus	$426 88	
F. Krantz, apparatus	34 61	
Peter Stoe, Heidelberg, apparatus	29 76	
Swift & Son, London, Eng., instruments	83 63	
W. H. Tomlinson, cases, etc	60 15	
C. W. Irwin, brokerage	3 67	
Maintenance:		
Fletcher Mfg. Co., sundries	22 90	
Mineralien Niederlage, specimens	2 38	
J. J. Griffin & Son, supplies for laboratory	121 62	
Peter Stoe, supplies for laboratory	40 40	
Swift & Son, supplies for laboratory	65 29	
Eimer & Amend, supplies for laboratory	95 35	
Lyman, Knox & Clarkson, alcohol	3 80	
Lyman Bros. & Co., chemicals	8 64	
Patterson & Heward, brass plates	12 50	
Chas. Rogers & Son Co., repairs to case	10 80	
T. A. Ovens, painting and glazing	22 75	
C. W. Irwin, brokerage, etc	57 99	
A. J. Reading, slides	2 10	
Wm. Cane, case and keys	3 50	
T. S. Plaskett, services	1 00	
White & Thomas, boxes, etc	4 75	
Canada Paper Box Co., trays	23 50	
T. Painter, refitting drawers	2 50	
R. J. Hovenden, numbering tables	5 30	
Frazee Storage Co., cartage	16 10	
Monarch Typewriter Co., typewriter	115 00	
G. T. R., freight paid	2 18	
University Press, printing, etc	42 83	
J. A. M. Dawson, assistance	80 00	
Dr. T. L. Walker, petty disbursements	11 37	
Museum cases and specimens:		
Grebel, Wendler & Cie., specimens	68 16	
F. Krantz, specimens	495 89	
Mineralien-Niederlage, specimens	92 93	
Foote Mineral Co., minerals	89 10	
Charles Rogers & Sons, cases	222 00	

22. *Mineralogical and Geological Department.*—Continued.

J. Coulter & Co., trays	$28 89	
Alf. Coyell, blocks, hooks, etc	7 45	
C. W. Irwin, freight	22 76	
University Press, printing	28 69	
Clerical Assistance:		
Miss A. E. Wilson, 100½ days	201 00	
		$2,670 12
(*b*) Geology:		
Palaeontology:		
Dr. F. Krantz, Bonn, fossils	$434 57	
G. K. Greene, fossils	140 45	
Mineralien-Comptoir, fossils	30 88	
L. W. Stilwell, fossils	156 00	
Joseph Townsend, fossils	30 00	
Max Weg, illustrations	9 93	
C. W. Irwin freight and charges	29 78	
Dr. Parks, travelling expenses	54 10	
		885 71
Collector:		
J. Townsend, 3 months' remuneration	$150 00	
J. Townsend, expenses	246 20	
		396 20
Maintenance:		
Office Specialty Mfg. Co., fyles, etc	$33 66	
A. J. Reading, slides	59 55	
J. G. Ramsey & Co., photo supplies	9 30	
Toronto Plate Glass Co., glass	3 10	
Grand & Toy, stationery	14 30	
Fletcher Mfg. Co., guards to saws	14 80	
Students' Book Department, books	2 15	
Wm. Cane, drilling walls	7 00	
Geo. Sparrow, covering	15 00	
Canada Paper Box Co., Ltd., trays	84 75	
A. Coyell, blocks, etc	8 35	
Patterson & Heward, brass plate	12 50	
Lyman Sons & Coy., chemicals, etc	30 12	
Eimer & Amend, chemicals, etc	89 05	
Brown Bros., binding	10 25	
Frazee Storage Coy., cartage	1 00	
C. W. Irwin, freight, etc	75	
University Press, printing, etc	42 83	
Dr. Parks, petty disbursements	40 75	
		479 21
Clerical Assistance:		
Miss A. M. Young, 39 weeks	$232 00	
G. Balfour, 39 days	78 00	
Miss A. E. Wilson, 6½ days	13 00	
		323 00
Museum Cases:		
Charles Rogers & Sons, Coy., cases	$982 00	
J. McCausland & Sons, varnishing	28 35	
		1,010 35
		$5,764 59

23. *Psychological Department.*

W. H. Fox, apparatus and repairs	$89 15
Bausch & Lomb Optical Coy., lenses, etc	18 94
Crofton Storage Battery Coy., battery	14 40
Canadian Westinghouse Coy., apparatus	22 50
Chandler, Ingram & Bell, beakers	3 60
A. J. Reading, slides	4 90
W. B. Sherk, slides	17 40
J. G. Ramsey & Coy., photo materials	4 80
Lockhart Photo Supply Coy., photo materials	10 50

23. *Psychological Department.*—Continued.

James McKenny, chemicals	$4 00	
Central Electric & School Supply Coy., electrical supplies...	10 94	
Canadian General Electric Coy., electrical supplies	36 58	
Steinberger, Hendry Coy., laboratory supplies	14 20	
Buntin-Reid Coy., cardboard	2 34	
Prang Educational Coy., colors	5 41	
Citizens' Gas Control Coy., gas governors	3 75	
Rice Lewis & Son, tool chest, etc	15 66	
R. Dinnis & Son, lumber	19 06	
Grand & Toy, fyles, etc	6 00	
Science Press, book	3 00	
Emil Monnich, books	9 43	
W. Engelmann, books	2 36	
Ferdinand Encke, books	15 80	
Gustav Fock, books	27 84	
United Typewriter Coy., balance on machine	30 00	
University Press, printing, etc	18 05	
A. Kirschmann, apparatus and laboratory expenses	26 00	
W. G. Smith, petty disbursements	48 39	
Joseph Allan, assistance at lectures	15 00	
		$500 00

24. *Mathematical Department.*

Students' Book Department, actuarial tables	$21 60	
University Press, printing	5 52	
		$27 12

25. *Astronomical Department.*

Franz Schmitt & Haensch, apparatus	$111 03	
Newton & Coy., apparatus	88 34	
Spindler & Hoyer, apparatus	76 00	
T. Cook & Sons, apparatus	13 75	
J. G. Ramsey & Coy., photo supplies	17 35	
University of Chicago Press, prints	2 43	
Lick Observatory, slides	1 57	
Lyman Bros., chemicals	3 74	
Galloway, Taylor & Coy., castings	1 92	
T. S. Plaskett, repairing pendulum	7 25	
C. W. Irwin, freight	25 27	
University Press, printing	4 30	
F. D. Blake, assistance	70 00	
H. Sherman, assistance	25 00	
		$447 95

26. *Political Science.*

University Press, stationery and printing	$10 92	
		$10 92

27. *History.*

Professor W. Colby, cards	$7 55	
Copp, Clark Coy., map, etc	5 60	
Grand & Toy, note books	3 00	
University Press, printing	12 19	
Miss A. M. Gall, typewriting	4 41	
		$32 75

28. *Italian and Spanish.*

A. J. Reading, lantern slides	$18 15	
Canadian Typewriter Coy., supplies	10 15	
Grand & Toy, fyles	1 50	
Students' Book Department, books	1 45	
T. Eaton Coy., books	2 00	
Miss Arnoldi, binding	60	
University Press, stationery and printing	15 85	
		$49 70

29. *University Studies.*

H. H. Langton, general Editor's remuneration	$200 00	
Bryant Press, printing and binding	1,824 14	
University Press, printing, etc	106 75	
Brown Bros., binding, etc	335 86	
Miss Denison, typewriting	57 50	
Heliotype Printing Coy., illustrations	99 15	
Patterson & Heward, stamp	11 00	
Journal of Physical Chemistry, copies of articles	66 93	
Journal of Experimental Medicine, copies of articles	9 06	
Society of Chemical Industry, copies of articles	9 84	
Robinson & Heath, freight charges	5 03	
H. H. Langton, compilation of index	25 00	
Royalties and payments to Contributors:		
H. H. Langton, royalties on sales	61 90	
G. M. Wrong, royalties on sales	61 90	
J. E. Roy, contributor	20 00	
Lieut.-Col. E. Cruickshank, contributor	20 00	
Prof. A. F. Chamberlain, contributor	10 00	
J. H. Coyne, contributor	8 00	
S. J. McLean, contributor	8 00	
Major William Wood, contributor	7 00	
Prof. Henri Lorin, contributor	7 00	
Prof. W. F. Ganong, contributor	6 00	
Prof. F. G. Walton, contributor	6 00	
James Bain, contributor	5 00	
W. J. Alexander, contributor	5 00	
A. P. Coleman, contributor	4 00	
W. L. Grant, contributor	4 00	
G. U. Hay, contributor	2 50	
J. S. Carstairs, contributor	2 00	
A. H. F. Lefroy, contributor	2 00	
Prof. A. Shortt, contributor	2 00	
L. Gerin, contributor	1 00	
The Bursar, expenses *re* remittances to contributors ...	27	
		$2.993 83
Less chargeable to University Studies Trust Funds Account....		1,643 83
		$1,350 00

30. *Dining Hall.*

University Dining Hall Committee, grant towards maintenance	$500 00	
		$500 00

31. *Educational Association Reception.*

University Dining Hall, refreshments	$200 00	
C. M. Richardson, cartage of chairs, etc	22 50	
J. A. Gardiner, assistance at lantern	1 50	
R. M. Motherwell, assistance at lantern	1 50	
T. S. Plaskett, assistance at demonstrations	2 00	
W. H. Fox, assistance at demonstrations	6 50	
F. Hanmer, labor	10 00	
A. Giddens, labor	2 00	
		$246 00

32. *Summer Session (1906).*

Remuneration to Lecturers:	
A. C. Casselman, Art	$200 00
J. H. Faull, botany, $200; expenses, $9.20	209 20
R. B. Thomson, botany	150 00
F. B. Allan, chemistry, $175; expenses, $2.72	177 72
F. B. Kenrick, chemistry	175 00
St. E. de Champ, French	200 00

32. *Summer Session (1906).*—Continued.

P. Toews, German	$200 00	
W. A. Parks, geology and mineralogy, $300; expenses, 2.25	302 25	
J. C. McLennan, physics, $200; expenses, $5.55	205 55	
H. F. Dawes, physics	125 00	
T. S. Plaskett, physics	25 00	
A. H. Abbott, psychology, $200; expenses, $3	203 00	
W. G. Smith, psychology	150 00	
J. Russell Maclean, reading	200 00	
W. H. Piersol, zoology, $250; expenses, $7.83	257 83	
A. G. Huntsman, Latin	25 00	
A. H. Abbott, postage and secretarial work	52 63	
C. E. Bradshaw, clerical assistance	5 00	
J. Allan, assistance in laboratory	30 00	
Teachers' Publishing Coy., advertising	4 03	
A. S. Barnes & Coy., advertising	2 83	
University Press, printing and stationery	7 53	
		$2,907 57

33. *Memorial Volume.*

William Briggs, printing and binding	$1,562 10	
Heliotype Printing Coy., plates	318 75	
Emery Walker, plates	159 66	
Toronto Engraving Coy., cuts	113 97	
A. J. Reading photographs	15 15	
Robinson & Heath, freight, etc	112 20	
Prof. Alexander, editing	300 00	
The Registrar, expenses of distribution	92 98	
	$2,674 81	
Less sale of copies	38 00	
		$2,636 81

34. *Art Reproductions.*

McKenzie & Coy., reproductions	$386 05	
Maison Adolphe Braun & Cie., reproductions	5 45	
A. J. Reading, mounting pictures	17 32	
Matthews Bros., framing	322 71	
J. Wicksey, hanging pictures	11 20	
University Press, printing	59 17	
Robinson & Heath, freight	9 67	
		$811 57

35. *Senate Elections.*

H. H. Langton, scrutineer	$35 00	
A. Carruthers, scrutineer	35 00	
A. C. Cameron, assistance	5 00	
P. Taylor, assistance	5 00	
Miss L. M. Coles, clerical assistance	25 00	
Miss M. Bucke, clerical assistance	15 00	
Geo. Hanmer, clerical assistance	3 00	
The Bursar, postage supplied to Registrar	202 00	
University Press, printing, etc	448 75	
		$773 75

36. *Trinity College.*

Bursar, Trinity College, students' car fares for transportation to University lectures	$227 19	
		$227 19

37. *Pensions.*

James Loudon, LL.D., annual pension	$5,500 00	
		$5,500 00

38. *University College Departments.*

Classics:		
(*a*) Greek:		
A. J. Reading, slides	$17 10	
Students' Book Department, books	1 35	
J. A. Gardiner, services	3 00	
	$21 45	
(*b*) Latin:		
A. J. Reading, slides	$32 55	
University Press, printing	35 04	
		$89 04
English:		
Mrs. M. W. Wallace, reading essays	$100 00	
Miss A. R. Riddell, reading essays	100 00	
		$200 00
French:		
Students' Book Department, books	$7 60	
A. J. Reading, slides	48 00	
St. E. de Champ, maps, etc	12 00	
C. Tarling, mounting maps, etc	7 20	
Miss Arnoldi, binding	70	
University Press, printing and stationery	2 70	
		$78 20
German:		
A. J. Reading, slides	$43 60	
Charles Potter, slides	14 05	
J. A. Gardiner, slides	90	
Students' Book Department, books	20 00	
University Press, printing	11 66	
		$90 21
Oriental Literature:		
Professor J. F. McCurdy, books	$59 80	
		$59 80
Stationery, etc.:		
University Press	$21 43	
The Bursar, postage supplied to Registrar	60 00	
A. J. Reading, slides	11 90	
		$93 33
Printing:		
University Press	$52 41	
		$52 41
Advertising:		
Trinity Year Book, advertisement	$12 50	
Canadian Almanac, advertisement	7 50	
"Torontonensis," advertisement	15 00	
St. Andrew's College Review, advertisement	10 00	
Mail and Empire, advertisement	16 80	
Toronto Globe, advertisement	15 68	
Toronto World, advertisement	3 96	
		$81 44
Incidentals:		
Miss Wreyford, physical instruction to women students.	$220 00	
University Dining Hall, refreshments at reception	40 00	
Gourlay, Winter & Leeming, rent of pianos	48 50	
R. Dinnis & Son, Ltd., new lockers	209 00	
T. A. Ovens, numbering lockers	3 50	
P. W. Ellis & Co., engraving medal	1 38	
		$522 38

39. *Unforeseen and unprovided for.*

Professor Henry Montgomery, travelling expenses collecting ethnological specimens in Western Canada	$1,000 00
H. H. Langton, expenses of Librarian and Architect to visit libraries in United States	145 87
Professor W. J. Loudon, towards experiments in Atmospheric Electricity	100 00
J. Watson Bain, Treasurer, grant towards meeting of American Chemical Society	500 00

39. *Unforeseen and Unprovided for.*—Continued.

Royal Astronomical Society, subvention to Journal	$100 00	
Professor R. Ramsay Wright, subscription to memorials of Lamarck and Schwann	20 00	
University Athletic Association, expenses of medical examination of athletes	553 90	
University Athletic Association, aid towards Athletics	300 00	
G. H. Corsan, instruction in swimming, 16 weeks	320 00	
Teachers' Course, Session 1905-6:		
Professor W. J. Alexander	50 00	
Rev. W. T. Allison	50 00	
Professor J. C. Fields	50 00	
Professor J. Fletcher	50 00	
Professor L. E. Horning	50 00	
Professor A. E. Lang	50 00	
Professor W. J. Loudon	50 00	
Professor M. A. Mackenzie	50 00	
Professor J. C. McLennan	50 00	
Professor W. S. Milner	50 00	
H. V. Routh	50 00	
Professor J. Squair	50 00	
Teachers' Course, Session 1906-7:		
A. E. Lang	100 00	
H. V. Routh	100 00	
W. T. Allison	50 00	
J. A. Gardiner	40 00	
		$3,929 77

II. Faculty of Medicine.

1. *Salaries.*

Dr. J. H. Richardson, Honorarium as retired Professor	$250 00	
Dr. Uzziel Ogden, Honorarium as retired Professor	250 00	
		$500 00
Anatomy:		
C. B. Shuttleworth, Demonstrator, (Sessional)	$450 00	
W. J. McCollum, Assistant Demonstrator (Sessional)	150 00	
S. H. Westman, " " "	150 00	
G. Elliott, " " "	150 00	
E. R. Hooper, " " "	150 00	
A. C. Hendrick, " " "	150 00	
A. J. Mackenzie, " " "	150 00	
D. McGillivray, " " "	150 00	
E. S. Ryerson, " " "	150 00	
F. W. Marlow, " " "	150 00	
W. A. Scott, " " "	150 00	
C. J. Copp, " " "	100 00	
G. E. Smith, " " "	100 00	
		$2,150 00
Pathology and Bacteriology:		
T. D. Archibald, Laboratory Assistant (Sessional)	$250 00	
G. Silverthorn, Demonstrator (Sessional)	150 00	
C. J. Wagner, Demonstrator (Sessional)	150 00	
W. H. Pepler, Assistant Demonstrator (Sessional)	150 00	
H. C. Parsons, Assistant Demonstrator (Sessional)	150 00	
M. M. Crawford, " " "	150 00	
F. A. Clarkson, " " "	150 00	
E. S. Ryerson, " " "	150 00	
G. W. Howland, " " "	100 00	
H. S. Hutchison, " " "	100 00	
M H. V. Cameron, Assistant in charge of Clinical Laboratory (Sessional)	$250 00	
J H. McPhedran, Assistant in Clinical Laboratory (Sessional)	100 00	
		$1,850 00

II. Faculty of Medicine.—*Continued.*

Pharmacy and Pharmacology:

		10% increase, 6 months from 1st January.	
V. E. Henderson, Lecturer, 9½ months' salary..	$1,029 17	$65 00	
C. P. Lusk, Demonstrator, (Sessional)	250 00		
D. A. L. Graham, J. MacLachlan, F. R. Miller, W. F. McPhedran, E. Fidler, W. B. Large, — Class Assistants (Sessional) at $25.00 each	150 00		
			$1,494 17
D. McGillivray, Tutor in Medicine (Sessional).	$100 00		
G. W. Howland, Tutor in Medicine (Sessional).	100 00		
T. D. Archibald, Tutor in Medicine (Sessional).	100 00		
			$300 00
Demonstrators and Associates:			
G. Boyd, Associate in Clinical Medicine, 12 months' stipend	253 50	12 68	
G. Chambers, Associate in Clinical Medicine, 12 months' stipend	253 50	12 68	
F. Fenton, Associate in Clinical Medicine, 12 months' stipend	152 00	7 60	
H. C. Parsons, Associate in Clinical Medicine, 12 months' stipend	152 00	7 60	
W. Goldie, Associate in Clinical Medicine, 12 months' stipend	152 00	7 60	
F. Fenton, Associate in Obstetrics, 12 months' stipend	152 00	7 60	
K. C. McIlwraith, Associate Obstetrics, 12 months' stipend	253 50	12 68	
W. McKeown, Demonstrator, Clinical Surgery, 12 months' stipend	253 50	12 68	
C. A. Temple, Demonstrator, Clinical Surgery, 12 months' stipend	253 50	12 68	
A. H. Garratt, Demonstrator, Clinical Surgery, 12 months' stipend	253 50	12 68	
C. B. Shuttleworth, Demonstrator, Clinical Surgery, 12 months' stipend	152 00	7 60	
T. B. Richardson, Demonstrator, Clinical Surgery, 12 months' stipend	152 00	7 60	
J. F. Uren, Demonstrator, Clinical Surgery, 12 months' stipend	152 00	7 60	
			$2,714 28
Associate Professors:			
C. L. Starr, Orthopaedics, 12 months' stipend	$380 00	19 00	
R. D. Rudolf, Medicine, etc., 12 months' stipend	380 00	19 00	
A. R. Gordon, Medicine, etc., 12 months' stipend	380 00	19 00	
R. J. Dwyer, Medicine, etc., 12 months' stipend	380 00	19 00	
H. A. Bruce, Clinical Surgery, 12 months' stipend	507 00	25 35	
F. N. G. Starr, Clinical Surgery, 12 months' stipend	507 00	25 35	
J. A. Amyot, Pathology, 12 months' stipend	507 00	25 35	
W. B. Thistle, Clinical Medicine, 12 months' stipend	507 00	25 35	
H. T. Machell, Obstetrics, etc., 12 months' stipend	355 00	17 75	
G. A. Bingham, Clinical Anatomy and Clinical Surgery, 12 months' stipend....	634 00	31 70	

II. Faculty of Medicine.—*Continued*

		10% increase, 6 months from 1st January.	
H. W. Aikins, Anatomy, 12 months' stipend	634 00	31 70	
W. P. Caven, Clinical Medicine, 12 months' stipend	634 00	31 70	
A. M. Baines, Clinical Medicine, 12 months' stipend	634 00	31 70	
J. T. Fotheringham, Clinical Medicine, 12 months' stipend	634 00	31 70	
H. B. Anderson, Clinical Medicine, 12 months' stipend	634 00	31 70	
C. Trow, Ophthalmology, etc., 12 months' stipend	380 00	19 00	
D. J. G. Wishart, Laryngology, etc., 12 months' stipend	304 00	15 20	
W. T. Stuart, Medical Chemistry, 12 months' stipend	500 00	25 00	
			$9,335 55
Professors:			
A. Primrose, Anatomy, 12 months' stipend.	$2,000 00	$100 00	
J. J. Mackenzie, Pathology, etc., 12 months' stipend	3,200 00	160 00	
I. H. Cameron, Surgery and Clinical Surgery, 12 months' stipend	950 00	47 50	
F. LeM. Grasett, Surgery and Clinical Surgery, 12 months' stipend	950 00	47 50	
G. A. Peters, Surgery and Clinical Surgery, 12 months' stipend	950 00	47 50	
L. Teskey, Surgery and Clinical Surgery, 12 months' stipend	950 00	47 50	
A. McPhedran, Medicine and Clinical Medicine, 12 months' stipend	950 00	47 50	
J. L. Davison, Clinical Medicine, 12 months' stipend	950 00	47 50	
C. Sheard, Preventive Medicine, 12 months' stipend	950 00	47 50	
J. A. Temple, Operative Obstetrics, etc., 12 months' stipend	950 00	47 50	
A. H. Wright, Obstetrics, 12 months' stipend	950 00	47 50	
W. Oldright, Hygiene, 12 months' stipend.	950 00	47 50	
J. F. W. Ross, Gynaecology, 12 months' stipend	634 00	31 70	
J. M. MacCallum, Pharmacology, etc., 12 months' stipend	634 00	31 70	
N. A. Powell, Medical Jurisprudence, 12 months' stipend	634 00	31 70	
R. A. Reeve, Ophthalmology, etc., 12 months' stipend	380 00	19 00	
G. R. McDonagh, Laryngology, etc., 12 months' stipend	380 00	19 00	
W. H. Ellis, Toxicology, 12 months' stipend	317 00	15 85	
G. S. Ryerson, Ophthalmology, etc., 12 months' stipend	253 50	12 68	
G. H. Burnham, Ophthalmology, etc., 12 months' stipend	253 50	12 68	
N. H. Beemer, Medical Psychology, 12 months' stipend	420 00	21 00	
			$19,536 31
General Service:			
A. Primrose, Secretary to Faculty, 12 months' salary	$1,200 00	$60 00	
J. J. Mackenzie, Assistant Secretary, 12 months' salary	100 00	5 00	

II. Faculty of Medicine.—*Continued.*

		10% increase, 6 months from 1st January.	
Thomas Motton, Caretaker Medical Building, 12 months' salary	720 00		
J. S. Pollock, Chief Engineer, Medical Building, 12 months' salary	800 00		
T. K. Hagan, Assistant Engineer, 6 months' salary	293 50		
Alex. Wilson, Janitor, Medical Building, 12 months' salary	600 00		
G. Lynne, Attendant, Anatomical Department, 12 months' salary	660 00		
J. Sherman, Attendant, Anatomical Department, 12 months' salary	480 00		
G. Williamson, Laboratory boy (Pathology), 12 months' salary	264 00		
Miss M. Armour, Stenographer, 12 months' salary	580 00	29 00	
Miss M. E. Foote, Stenographer, 12 months' salary	480 00	24 00	
Miss I. E. Ruttan, Stenographer, 10 months' salary	336 00		
A. Pride, Occasional Attendant (Anatomy)	50 00		
			$6,681 50
			$44,561 81

2. *Anatomical Department.*

Dissecting material:		
F. W. Matthews, subjects	$112 00	
D. J. Harris, subjects	80 00	
C. D. Blachford, subjects	65 00	
J. H. Millard, subjects	50 00	
A. Klippert, subjects	40 00	
C. Ranny, subjects	40 00	
J. A. Grobb, subjects	30 00	
J. J. Cheyne, subjects	20 00	
D. Belleghem, subjects	20 00	
S. Goodwin, subjects	20 00	
J. Rogers, subjects	20 00	
H. Field, subjects	15 00	
H. McBride, subjects	15 00	
B. E. Sells, subjects	15 00	
J. L. Tickell, subjects	15 00	
A. Millard, subjects, fees and expenses	440 40	
A. Primrose, expenses *re* subjects	138 60	
J. A. Carveth & Coy., bones	59 81	
Material for preservation, chemicals, etc.:		
Inland Revenue Department, methylated spirits	147 29	
W. Lloyd Wood, chemicals	184 55	
Ontario Medical College, alcohol	48 00	
Incidental expenses:		
John Catto & Son, cotton and towels	302 58	
Chandler, Ingram & Bell, laboratory supplies	3 45	
J. F. Hartz Coy., sounds	2 80	
J. A. Carveth & Coy., crayons	8 65	
Steinberger, Hendry Coy., crayons	3 50	
Queen City Plate Glass Coy., glass	2 40	
Michie & Coy., soap, matches, etc	21 10	
McColl Bros., oil, soap, etc	12 32	
Miller Mfg. Coy., cleaning coats, etc	9 50	
Art Metropole, tacks	90	
W. T. Wilson, hardware	29 61	
Rice Lewis & Son, shellac	1 75	
Sanderson Pearcy Coy., bronze	1 50	
W. J. Dunlop, plumbing	11 80	

2. *Anatomical Department.*—Continued.

J. Haynes, cartage		1 90	
Robinson & Heath, freight		2 00	
Mrs. Clark, washing towels		33 64	
A. Primrose, petty disbursements		23 98	
		$2,049 03	
Less paid by Dr. Primrose from Students' Account.	$91 09		
And paid by Ontario Medical Council for use of material	100 00		
		191 09	
			$1,857 94

3. *Pathology and Departments other than Anatomy.*

Chemicals, Laboratory Supplies, etc.:		
Eimer & Amend, chemicals	$143 32	
W. Lloyd Wood, chemicals	117 37	
J. F. Hartz Coy., supplies	69 40	
Chandler, Ingram & Bell, boxes, etc	21 10	
Ontario Rubber Coy., tubing, etc	7 00	
Central Electric & School Supply Coy., supplies	2 85	
Inland Revenue Department, methylated spirits	69 50	
Dominion Carbonic Coy., gas	9 30	
Toronto Liquid Carbonate Coy., gas	10 50	
Lake Simcoe Ice Co., ice	31 50	
E. Harris Coy., wax, etc	2 80	
Queen City Oil Coy., wax, etc	1 76	
Volta Electric Repair Works, repairing arc lamp	4 50	
Apparatus, Microscopes, etc.:		
Eimer & Amend, apparatus	155 14	
Toronto General Hospital, apparatus	16 00	
Beaver Flint Glass Coy., tubes	11 13	
J. A. Carveth & Coy., apparatus	3 60	
A. J. Reading, slides	18 60	
Steinberger, Hendry Coy., blackboard	5 50	
Incidental Expenses:		
T. Motton, food for animals, etc	200 69	
Brown Bros., mimeograph, etc	36 80	
Grand & Toy, stationery	8 50	
Matthews Bros., framing	15 00	
C. B. Williams, lumber	6 44	
G. & J. Murray, mantles, etc	3 50	
J. Hall, cartage	4 50	
Equipment for Pharmacy and Pharmacology:		
Kny-Scheerer Coy., apparatus and supplies	339 30	
Eimer & Amend, chemicals	153 99	
Lyman, Knox & Clarkson, chemicals	189 89	
Burroughs, Wellcome Coy., chemicals	15 79	
Ontario Rubber Coy., corks, etc	17 98	
Freyseng Cork Coy., corks	5 57	
Robinson & Heath, freight	41 38	
University Press, printing and stationery	35 59	
V. E. Henderson, disbursements	107 28	
Clinical Assistance, Department of Medicine:		
E. C. Burson	50 00	
A. B. Wright	50 00	
H. S. Hutchison	50 00	
Brefney O'Reilly	50 00	
		$2,083 07

4. *Maintenance Medical Building.*

Elias Rogers Coy., fuel	$2,566 91	
Consumers' Gas Coy., gas	244 45	
Toronto Electric Light Coy., electric current	624 33	
City Treasurer, water	393 32	
W. Fenton, cleaner	480 00	
A. E. Giddens, cleaner	480 00	
W. J. McGuire & Coy., repairs to plumbing	174 36	
W. Mashinter, plumbing	61 41	
R. Robertson, repairing boilers	81 89	
Wheeler & Bain, repairing trough, etc	14 61	
Rice Lewis & Son, hardware, etc	60 21	
Aikenhead Hardware, hardware, etc	4 74	
Vokes Hardware, hardware, etc	30	
Russill Hardware Coy., hardware, etc	1 20	
J. T. Mackay, electrical supplies and work	15 85	
Central Electric & School Supply Coy., electrical supplies	26 46	
Canadian General Electric Coy., electrical supplies	1 37	
G. & J. Murray, lights	8 05	
Otis Fensom Elevator Coy., repairs to elevator	34 50	
Jones & Moore, repairs to motor	5 40	
Reid & Brown, boiler supplies	1 00	
T. Eaton Coy., window shades, towels, etc.	65 13	
R. Simpson Coy., chairs, etc	29 00	
John Kay, Son & Coy., rugs, etc	34 70	
F. J. Moore, furniture	35 00	
W. P. Godard, upholstering lounge	15 00	
Office Specialty Mfg. Coy., card cabinet	19 65	
E. B. Eddy Coy., toilet paper	23 40	
T. Motton, washing towels	124 64	
Toronto Window Cleaning Coy., cleaning windows	45 00	
Canadian Oil Coy., soap, oil, etc	71 25	
Sanderson Pearcy Coy., oil, etc	1 50	
David Bell, soap, etc	27 00	
G. W. Grant & Coy., oil, etc	20 33	
United Factories, brushes, etc	12 46	
D. S. Bowman, whitewashing	35 00	
Stewart & Wood, glass, paint, etc	19 52	
Depew Carbon Paint Coy., paint, etc	8 50	
Geo. Pearsall, putty, etc	3 21	
Lyman Bros., chemicals	29 74	
Economical Mfg. Coy., graphite, etc	8 10	
Eureka Mineral Wool Coy., asbestos	6 15	
G. Brimstin Coy., keys	18 43	
E. H. Roberts, keys	2 40	
Fletcher Mfg. Coy., sundries	1 15	
Tolton & McIntosh, sundries	1 50	
J. A. Carveth & Coy., crayons	11 85	
Steele, Briggs Coy., grass seed	60	
W. Lowe, castings	6 90	
J. Hall, cartage	6 00	
J. Haynes, cartage	1 50	
	$5,964 97	
Less share payable by Physiological Department, Faculty of Arts	2,500 00	
		$3,464 97

5. *General Expenses.*

University Press, printing calendar, etc	$1,030 68	
Brown Bros., stationery, binding, etc	60 95	
United Typewriter Coy., typewriter and supplies	133 20	
Ontario Medical Library, office supplies	6 12	
Grand & Toy, office supplies	1 20	
A. Primrose, general disbursements, postage, etc., for Session	144 49	
Ontario Publishing Coy., advertising	125 00	
Westminster Coy., advertising	100 00	
University of Toronto Monthly, advertising	100 00	

5. *General Expenses.*—Continued.

Can. Practitioner & Review, advertising	100 00	
Can. Journal of Med. and Surg., advertising	93 34	
Presbyterian S.S. Publications, advertising	91 67	
Educational Publishing Coy., advertising	70 00	
Queen's Quarterly, advertising	60 00	
Acta Victoriana, advertising	50 00	
Dominion Medical Monthly, advertising	40 00	
Montreal Medical Journal, advertising	45 00	
Varsity, advertising	35 00	
Torontonensis, advertising	30 00	
Ontario Normal College Monthly, advertising	25 00	
Trinity University Year Book, advertising	25 00	
Maritime Medical News, advertising	27 00	
Ontario Educational Association, advertising	20 00	
Lux Columbiana, advertising	17 50	
Acta Ridleiana, advertising	15 00	
Trinity College School Record, advertising	13 50	
Hutchison & Coy., medals	47 22	
Ryrie Bros., engraving medals	8 40	
Dr. R. A. Reeve, expenses as Dean of Faculty	785 00	
Bell Telephone Coy., telephone service	164 20	
Toronto Electric Light Coy., lamps, etc	31 09	
Ontario Rubber Coy., tube	4 38	
Ellis, book	15 34	
R. L. Polk & Coy., Medical Directory	6 00	
Toronto Directory	6 00	
L. C. Brady, correcting Medical Register	6 50	
Steinberger, Hendry Coy., blackboard for Hospital work...	9 50	
Art Metropole, drawing materials	94	
J. Wicksey, services at opening lecture	3 50	
Golden's Livery, cab hire	4 25	
Doane Bros., cab hire	2 00	
C. M. Richardson, cartage	18 50	
	$3,572 47	
Less balance carried forward from 1905-6	379 43	
		$3,193 04

6. *Special Instruction to Women Students.*

D. McGillivray, T. D. Archibald, G. W. Howland, Instructors in Medicine and Clinical Medicine.	$150 00	
	150 00	
	150 00	
C. B. Shuttleworth, Instructor in Surgery and Clinical Surgery	150 00	
W. J. McCollum, Tutor in Medicine	150 00	
E. S. Ryerson, Demonstrator in Clinical Surgery	150 00	
G. Silverthorn, Demonstrator in Surgery and Clinical Surgery	150 00	
K. C. McIlwraith, F. Fenton, Instructors in Obstetrics.	100 00	
	100 00	
S. H. Westman, Instructor in Anatomy	100 00	
W. H. Ellis, Instructor in Toxicology	100 00	
G. Boyd, J. M. MacCallum, Instructors in Ophthalmology, Otology and Rhinology.	100 00	
	100 00	
F. W. Marlow, Demonstrator in Gynaecology	100 00	
E. A. McCullough, Instructor in Jurisprudence	100 00	
Brefney O'Reilly, Assistant Demonstrator in Pathology	50 00	
Ontario Medical College for Women, Ltd., microscopes	300 00	
		$2,200 00
		$12,799 02

III. Faculty of Applied Science.

1. Salaries.

Engineering.

		10% increase, 6 months from 1st January.	
J. Galbraith, Professor, also Dean of the Faculty, 10 months' salary at $3,200.....	$2,666 00	$160 00	
			$2,826 00

Electrical Engineering.

T. R. Rosebrugh, Professor, 10 months' salary at $2,200	$1,833 00	$110 00	
H. W. Price, Lecturer, 4 months at $1,300, 6 months at $1,400	1,133 00	70 00	
H. G. Smith, Demonstrator, 4 months at $800, 6 months at $900	716 00	45 00	
H. S. Fierheller, Demonstrator, 9 months' salary at $700	525 00	35 00	
E. Thompson, Laboratory Attendant, 5 months' salary at $400	166 66		
A. H. Fisher, Laboratory Attendant, 3¾ months' salary at $500	162 65		
			$4,796 31

Mechanical Engineering.

R. W. Angus, Professor 4 months at $1,800, 6 months at $1,900	$1,550 00	$95 00	
M. R. Riddell, Lecturer, 9 months' salary at $1,200	900 00	60 00	
R. Fullarton, Laboratory Assistant, 6 months at $500. 6 months at $550	525 00		
			$3,130 00

Chemistry.

W. H. Ellis, Professor of Applied Chemistry, 4 months at $2,100, 6 months at $2,200.....	$1,800 00	$110 00	
E. G. R. Ardagh, Lecturer in Applied Chemistry, (formerly Demonstrator) 4 months at $800, 6 months at $1,200	866 00	60 00	
J. W. Bain, Associate Professor of Analytical Chemistry (formerly Lecturer), 4 months at $1,500, 6 months at $1,800	1,400 00	90 00	
M. C. Boswell, Lecturer, Organic Chemistry, (formerly Demonstrator) 4 months at $700, 6 months at $1,200	833 00	60 00	
S. Dushman, Demonstrator, Electro-Chemistry, 10 months' salary at $700.....	582 00	35 00	
D. Sinclair, Attendant, Chemistry, 12 months' salary	800 00		
J. Carson, Laboratory Attendant, 6 months at $180; 6 months at $250	215 00		
			$6,851 00

Geology.

A. P. Coleman, Professor, 10 months' salary at $2,200, balance of salary in Faculty of Arts	$1,833 00	$110 00	
			$1,943 00

III. Faculty of Applied Science.—*Continued.*

Surveying.

		10% increase, 6 months from 1st January.	
L. B. Stewart, Professor, 10 months' salary at $2,200	$1,833 00	$110 00	
W. M. Treadgold, Lecturer, 8 months' salary at $1,200	800 00	60 00	
S. R. Crerar, Demonstrator, 6 months' salary at $700	350 00	35 00	
			$3,188 00

Mining.

G. R. Mickle, Professor, 4 months at $1,900; 6 months at $2,000	$1,633 00	$100 00	
J. G. McMillan, Demonstrator, 1 month at $800	66 00		
E. Wade, Demonstrator, 9 months' salary at $700	525 00	35 00	
E. Tozer, Attendant, 12 months' salary	400 00		
J. Deacon, Attendant in Metallurgy, 6 months at $350; 4 months at $372	299 00		
			$3,058 00

Architecture and Drawing.

C. H. C. Wright, Professor of Architecture, 6 months' salary at $2,200	$1,833 00	$110 00	
T. R. Loudon, Demonstrator in Drawing, 3 months at $700, resigned	175 00		
D. K. Ambrust, Attendant in Drafting Rooms, 6 months at $400; 6 months at $450	425 00		
J. Safana, Attendant in Drafting Rooms, 9 months' salary at $350.00	262 50		
			$2,805 50

Applied Mechanics.

J. McGowan, Associate Professor (formerly Lecturer), 4 months at $1,500; 6 months at $1,800	$1,400 00	$90 00	
			$1,490 00

Physics.

G. R. Anderson, Lecturer, 4 months at $1,300; 6 months at $1,400	$1,133 00	$70 00	
			$1,203 00

Theory of Construction.

P. Gillespie, Lecturer, 4 months at $1,300; 6 months at $1,400	$1,133 00	$70 00	
			$1,203 00

Descriptive Geometry.

J. R. Cockburn, Lecturer, 4 months at $1,300; 6 months at $1,400	$1,133 00	$70 00	
			$1,203 00

Thermo-Dynamics.

W. W. Gray, Demonstrator, 10 months at $700.	$582 00	$35 00	
			$617 00

III. Faculty of Applied Science.—*Continued.*

			10% increase, 6 months from 1st January.	
Hydraulics.				
J. J. Traill, Demonstrator, 6 months at $700...		$350 00	$35 00	
				$385 00
Strength of Materials.				
W. Barber, Demonstrator, 9 months at $700....		$525 00	$35 00	
				$560 00
Fellows.				
F. Barber, C. C. Forward, G. W. Paterson, T. E. Rothwell, G. H. Ferguson, W. C. Blackwood, H. M. Lancaster, J. D. Keppy, E. L. C. Forster, S. L. Fear, W. Huber, W. MacKinnon, A. G. Creighton.	at $500 each for the Session	$6,500 00		
T. W. Brown, E. A. Uren,	7 months' salary each, at $500 for the Session.	882 00		
S. R. Crerar, J. J. Traill,	3 months' salary each at $500 for the Session.	375 00		
R. H. Armour, R. B. Ross, S. E. McGorman, C. B. Aylesworth, C. M. Teasdale, J. D. Shepley, W. E. Douglas, J. Park, E. Wade, E. W. Walker, L. W. Morden, S. R. Crerar, D. T. Townsend, N. M. Bristol,	One payment each of $41	574 00		
				$8,331 00
General Service.				
A. T. Laing, Secretary to the Faculty and Librarian, 4 months at $1,600; 6 months at $1,700		$1,382 00	$85 00	
Miss A. J. Rickard, Stenographer, 4 months at $450; 6 months at $500		400 00	25 00	
Miss J. Weir, Stenographer, 4 months at $400; 6 months at $450		358 65	22 50	
V. R. Ardagh, Messenger, 10 months' salary.....		150 00		
C. S. Whyte, Messenger, 8 1/3 months' salary....		125 00		
W. J. Graham, Caretaker, Engineering Building, 6 months at $900; 6 months at $1,000.....		950 00		
E. Allan, Assistant Caretaker, Engineering Building, 6 months at $425; 6 months at $450		437 50		

III. Faculty of Applied Science.—*Continued.*

General Service.—Continued.

W. Simpson, Engineer and Machinist, Engineering Building, 12 months' salary	$1,200 00	
Jas Kerr, Fireman, Engineering Building, (8 months)	400 00	
A. Lepper, Fireman, Engineering Building, (4 months)	200 00	
E. Bishop, Caretaker, Chemistry and Mining Building, 6 months at $800; 6 months at $900	850 00	
J. Clark, Assistant Caretaker, C. & M. Building, 12 months' salary	650 00	
S. Hunter, Engineer, C. & M. Building, 12 months' salary	1,200 00	
A. Kennedy, Fireman, C. & M. Building, (9 months)	450 00	
J. Sheridan, Fireman, C. & M. Building, (4 months)	200 00	
E. Whittaker, Fireman, C. & M. Building, (2 months)	100 00	
J. Lochhead, Fireman, C. & M. Building (7 months)	350 00	
J. Cowan, Fireman, Experimental Steam Plant (7 months)	350 00	
W. S. Poole, General Workman, 12 months' salary	650 00	
J. S. McCracken, carpenter, 6 months at $750; 6 months at $800	775 00	
Chas. Soady, Gardener, 12 months' salary	700 00	
J. J. Passmore, Night-watchman, 12 months at $750 and arrears	793 00	
		$12,803 65
		$56,393 46

2. *Maintenance.*

Laboratory Supplies:	
Canadian General Electric Co., electrical supplies	$792 62
Central Electric & School Supply Co., electrical supplies	146 40
Rogers Electric Co., electrical supplies	30 51
Canadian Westinghouse Co., motor, etc	11 50
Weston Electrical Instrument Co., supplies	90 37
R. A. L. Gray & Co., electrical work, etc	398 82
Dodge Manufacturing Co., pulleys and couplings	32 21
Canadian Fairbanks Co., supplies	5 45
Charles Potter, apparatus, charts, etc	132 79
Fletcher, Russell Co., supplies	61 20
Toronto Electric Light Co., lamp	20 00
Armstrong & Hatch, apparatus	3 50
W. Kennedy & Sons, apparatus	31 99
Canada Chemical Mfg. Co., Ltd., chemicals	116 91
Lyman Bros. & Co., chemicals	157 13
E. Merck, Darmstadt, chemicals	151 21
J. T. Baker Chemical Co., chemicals	60 62
Haas Bros., quicksilver	35 25
National Carbon Co., supplies	23 95
Baker & Adamson Chemical Co., supplies	4 96
Chemical Laboratory, Limited, supplies	40 07
Hamilton Steel & Iron Co., magnesite bricks	8 75
Ward's Natural Science Establishment, crysolite	7 56
J. G. Harvey, ammonia	10 01
Coniagas Mines, Limited, ore	9 50
Rice Lewis & Son, hardware	791 52
Fletcher Mfg. Co., hardware, etc	364 95
Vokes Hardware Co., hardware	2 50
Newton & Co., slides	208 70

III. Faculty of Applied Science.—*Continued.*

2. *Maintenance.*—Continued.

H. F. Sharpe & Co., photo supplies	$319 53
Electro Chemical Co., supplies	5 80
Toronto Liquid Carbon Co., carbonic acid gas	17 00
Purdy, Mansell & Co., supplies	138 56
H. C. Tugwell & Co., photo supplies	302 99
Toronto Lithographing Co., maps	142 50
Students' Book Department, books	205 68
University Art Shop, book	48 25
American School Correspondence, books	19 90
Grand & Toy, books	5 10
Wm. Briggs, book	1 30
Coutts & Co., periodical	9 84
A. P. Hallock, periodical	8 06
J. W. Bain, periodical	7 32
Vannevar & Co., book	7 50
Art Metropole, supplies	135 00
Beaver Flint Glass Co., tubes, etc	37 32
Ontario Rubber Co., supplies	45 38
Canadian Rubber Co., packing	8 62
Gutta Percha & Rubber Co., supplies	6 57
J. Whitfield, rods, chair pins, etc	93 25
A. Peterson Estate, frames	17 25
Beardmore Belting Co., supplies	17 95
Westman & Baker, cutting screens	20 05
Dean Bros., castings	9 46
National Oil Co., oil	313 89
Ontario Lime Association, supplies	33 00
Treloar, Blashford & Co., castings	6 67
Canada Paper Co., cards	31 30
Alexander Engraving Co., diagrams	2 00
Duncan Bros., frame	2 00
American Tent & Awning Co., machine covers, etc	31 75
C. B. Williams, stakes	18 00
Toronto Plate Glass Co., glass	13 65
Vereinigte Fabriken, supplies	14 18
United Typewriter Coy., laboratory typewriter	135 00
Lockhart Photo Supply Coy., photo materials	97 95
William Simpson, wood	18 54
T. G. Rice Coy., wire screen	17 70
Morrison Brass Coy., supplies	14 90
Lake Simcoe Ice Coy., ice	13 95
United Electric Coy., plugging	11 60
T. W. Barber, coke	9 00
J. Lucas & Coy., cement	9 15
Standard Lime Coy., lime	2 68
John McDonald & Coy., cotton	8 40
Ryrie Bros., watch	7 75
Dominion School Supply Coy., rubber stoppers	6 41
Freyseng Cork Coy., corks	67
Polson Iron Works, iron	6 60
Robb & Kay, iron work	22 30
M. Armstrong, couplings, etc	45 33
J. A. Goddard, shifting motors, etc	14 50
W. Wanty, repairing assay furnaces	19 30
J. Foster, repairing instruments	26 50
T. H. Robinson, repairing instruments	4 15
Volta Electric Works, repairs	23 75
Fiddes & Hogarth, repairs	60 00
J. B. Smith & Sons, lumber, etc	123 47
Alfred Covell, cupboards, etc	86 50
P. W. Ellis & Coy., belting	2 16
E. Harris Coy., glass	5 50
Leeds & Northrup Coy., glass	3 36
A. Kleiser, cutters	60

III. Faculty of Applied Science.—*Continued.*

2. *Maintenance.*—Continued.

Canadian Stamp & Stencil Coy., stamp	$1 00	
Chandler, Ingram & Bell, dish	1 40	
Metropolitan Oil & Soap Coy., soap	6 75	
W. A. Murray & Coy., towels	7 50	
A. T. Thompson & Coy., carbons	93	
Otto Higel Coy., grinding	1 80	
Lester Storage Coy., cartage	1 50	
Hupfield Ludecking & Coy., freight	10 92	
Baird & Tatlock, freight	4 58	
Wm. Harper, freight	2 05	
Robinson & Heath, freight	120 50	
A. T. Laing, freight	29 20	
		$6,833 42
Laboratory Apparatus, etc.:		
Eimer & Amend, apparatus	$770 91	
Kny-Sheerer Coy., apparatus	608 26	
Weston Electrical Instrument Coy., apparatus	608 15	
W. & L. E. Gourlay, apparatus	452 27	
P. P. Caproni, apparatus	451 28	
J. Bishop & Coy., apparatus	337 08	
C. Potter, apparatus	327 77	
Leeds & Northrup Coy., apparatus	312 05	
Canadian General Electric Coy., apparatus	269 40	
Eberhardt & Metzger, apparatus	256 37	
Armstrong & Hatch, apparatus	197 65	
Carl Zeiss, apparatus	152 10	
Holtzer, Cabot & Coy., apparatus	133 50	
Ward Leonard Electric Coy., apparatus	122 28	
Packard Electric Coy., apparatus	120 50	
C. Engelhart, apparatus	63 31	
National Carbon Coy., apparatus	52 05	
Ezra A. Fear, apparatus	46 00	
Canadian Westinghouse Coy., apparatus	32 21	
Canadian Fairbanks Coy., apparatus	11 45	
Art Metropole, drawing instruments	15 60	
Aikenhead Hardware, micrometer	9 25	
Dodge Manufacturing Coy., pulleys, etc	6 20	
Sadler & Howarth, belts	4 30	
A. T. Thompson & Coy., coil	4 53	
Gutta Percha & Rubber Mfg. Coy., belting, etc	10 94	
Ontario Rubber Coy., tubing	5 93	
William Harper, freight, etc	45 61	
Robinson & Heath, freight, etc	16 77	
		$5,443 72
Printing, advertising and incidentals:		
University Press, printing, etc	$1,151 89	
Brown Bros., binding, etc	190 02	
Alumni Association, advertisement in University monthly	100 00	
The Globe, Christmas Number, advertisement	60 00	
Queen's Quarterly, advertisement	50 00	
Catholic Register, advertisement	50 00	
Canadian Mining Review, advertisement	45 00	
"Torontonensis," advertisement	30 00	
Engineering Society, advertisement	28 60	
Trinity Year Book, advertisement	25 00	
Westminster Coy., advertisement	22 50	
Canadian Journal of Med. & Surgery	20 00	
Catholic Directory, advertisement	20 00	
Canadian Mining Journal, advertisement	10 00	
The Presbyterian, advertisement	8 34	
Nesbitt Publishing Coy., advertising	12 50	
Biggar, Samuel, Limited, advertising	30 00	
Students' Book Department, books, etc	101 00	

III. Faculty of Applied Science.—*Continued.*

2. *Maintenance.*—Continued.

Lemcke & Buechner, books, etc	$67 10	
Engineering Magazine, index	10 06	
W. H. Guild & Coy., journals	11 10	
Wm. Tyrrell & Coy., journals	5 50	
Canadian Eletrical News, journals	1 00	
American Institute of Mining Engineers, journals	7 06	
American Society of Mining Engineers, journals	6 06	
Engineering and Mining Journal, journals	4 53	
Iron and Steel Institute, journals	4 00	
Institute of Mining & Mineralogy, journals	2 66	
Might Directories, directories	12 00	
Grand & Toy, office supplies	11 00	
Monarch Typewriter Coy., typewriter	109 50	
United Typewriter Coy., typewriter supplies	12 25	
Edith E. Shaw, filling in diplomas	48 40	
C. Gripton & Coy., date stamp	1 75	
A. T. Laing, postage and petty cash	231 64	
Lester Storage Coy., cartage of papers, etc	15 55	
Bell Telephone Coy., telephone service	234 37	
University of Toronto, ground rent to May, 1906	925 00	
		$3,675 38
Gas and Electric Light:		
Consumers' Gas Coy., gas	$421 64	
Toronto Electric Light Coy., electric current	982 99	
		$1,404 63
Water:		
City Treasurer, water	$726 44	
		$726 44
Fuel:		
Elias Rogers Coy., fuel	$5,725 93	
		$5,725 93
General repairs, furniture, cleaning materials, etc.:		
Canadian Heine Safety Boiler Coy., changing stokers in furnaces	$425 00	
Charles Rogers & Sons Coy., vestibute stair-case	520 00	
T. V. Gearing, general repairs, etc	717 62	
Alfred Coyell, general repairs, etc	474 48	
Wm. Wanty, general repairs, etc	209 10	
J. B. Smith & Sons, lumber	202 74	
R. Dinnis & Son, lumber	80 25	
R. A. L. Gray & Coy., electrical work	426 00	
T. A. Ovens, painting and glazing	282 40	
J. Stewart, painting and glazing	176 07	
J. McCausland & Son, varnishing	66 60	
W. J. McGuire & Coy., repairs to plumbing, etc	199 86	
Purdy, Mansell & Coy., repairs to plumbing, etc	155 00	
Fiddes & Hogarth, repairs to plumbing, etc	4 50	
Otis Fensom Elevator Coy., repairs	19 90	
Beaver Lock Works, repairs	29 85	
Kincade Bros., repairs	37 60	
F. Armstrong Coy., repairs	38 55	
Thomas Gander & Son, repairs	53 90	
G. C. Mooring, repairs	27 07	
W. J. Wilson, repairs	2 50	
Rice Lewis & Son, hardware	139 07	
Vokes Hardware Coy., hardware	78 76	
E. H. Roberts, hardware	25 85	
Wm. Cane, keys	3 75	
Smith Bros., keys	2 00	
Douglas Bros., moulding	6 10	
Wm. Hamblin, cement	5 30	
Clappison Packing Coy., mineral wool, etc	58 45	
Beardmore Belting Coy., belting	53 28	
Rhodes Metallic Packing Coy., packing, etc	19 70	

III. Faculty of Applied Science.— *Continued.*

2. *Maintenance.*—Continued.

Polson Iron Works, engine supplies	21 55	
James Morrison Brass Coy., engine supplies	26 92	
Office Specialty Mfg. Coy., furniture, etc	129 15	
G. N. Reynolds & Coy., furniture etc	88 00	
T. Eaton Coy., furniture, etc	84 48	
Adams Furniture Coy., furniture, etc	66 68	
John Kay, Son & Coy., linoleum	30 80	
E. N. Moyer Coy., blackboards	67 00	
Rogers Electric Coy., electrical supplies	64 74	
Canadian General Electric Coy., electrical supplies	35 54	
McDonald & Willson, electrical supplies	9 40	
National Oil Coy., oil, etc	172 16	
W. J. Saunderson, oil, etc	25 00	
Canadian Oil Coy., oil, etc	10 00	
India Alkali Works, cleaning material	34 58	
E. W. Gillett Coy., cleaning material	7 20	
Lever Bros., soap	12 10	
John Taylor & Coy., soap	3 60	
G. Pearsall, sharpening tools	1 65	
Mrs. O'Bryan, sewing	2 00	
J. A. Goddard, cartage of machinery for repairs	20 00	
Wm. Wanty, removal of ashes	107 60	
		$5,561 40
Temporary help:		
Fortnightly pay lists, women cleaners, etc	$1,093 53	
Mrs. Winters, washing towels	68 46	
Miss L. Hunn, stenographer, 3½ weeks	35 00	
H. Waters, watchman	20 00	
		$1,216 99
		$30,587 91
Total for Faculty of Applied Science		$86,981 37
Less expenditure prior to 1st January, 1907, paid from appropriation of the Legislative Assembly for maintenance account transferred to the Board of Governors under section 13 of the University Act, 1906:		
Salaries	$22,086 81	
Laboratory supplies and apparatus	3,966 24	
Printing, advertising and incidentals	1,977 33	
Gas and electric light	497 06	
Water	297 64	
Fuel	2,289 41	
General repairs, furniture, etc	1,692 64	
Temporary help	626 94	
		$33,434 07
Total for the six months January-June, 1907		$53,547 30

IV. Faculty of Household Science.

Salaries.

Miss A. L. Laird, Associate Professor of Household Science, 10½ months' salary	$1,575 00
Miss C. C. Benson, Associate Professor of Physiological Chemistry, and Secretary to Faculty, 10½ months' salary	1,575 00
Miss E. M. Eadie, Lecturer in Household Economics, (Sessional)	1,000 00
Miss M. B. Tamblyn, Instructor in Household Science, (Sessional)	800 00
Miss M. Craig, Instructor in Household Science, (Sessional)	600 00

IV. Faculty of Household Science.– *Continued*

Salaries.—Continued.

Miss O. Patterson, Instructor in Physiological Chemistry (Sessional)	500 00	
Miss M. Proctor, Laboratory Assistant (Sessional)	400 00	
Dr. J. A. Amyot, Lecturer in Hygiene and Sanitation (Sessional)	300 00	
		$6,750 00

V. Faculty of Education.

Salaries.

Dr. W. Pakenham, Dean of the Faculty and Professor of the History and Science of Education, 6 months' salary	$1,250 00	
10% increase	125 00	
		$1,375 00

VI. Faculty of Forestry.

Salaries.

Dr. B. E. Fernow, Dean of the Faculty and Professor of Forestry, 3 months' salary	$875 00	
		$875 00

APPENDIX IV.

University Press.

Transactions Twelve Months Ending 30th June, 1907.

Operating Account.

Receipts during 1906-7	$11,613 05	
Accounts receivable 30th June, 1907	576 55	
		$12,189 60
Expenses:		
Printers' wages	$4,627 51	
Paper and other supplies	6,490 75	
Depreciation of plant	393 41	
Difference of inventory	384 08	
		$11,895 75
Surplus on operations 1906-7		$293 85
Balance at credit 30th June, 1906		1,073 43
Balance at credit 30th June, 1907		$1,367 28

Inventory 30th June, 1907.

Value of work in progress	$196 75	
Value of supplies on hand	769 50	
	$966 25	
Liabilities incurred by the Press for work in progress	687 41	
	$278 84	
Similar items 30th June, 1906	662 92	
Difference	$384 08	

Plant Account.

Plant as per return 30th June, 1906	$3,551 98
Additions to type, etc., 1906-7	382 17
	$3,934 15

Plant Account.—Continued.

10% depreciation	$393 41		
Difference in inventory	384 08	777 49	
Balance 30th June, 1907			$3,156 66
Net asset as per balance sheet			$1,789 38

Details of Expenditure.

Fortnightly Pay Lists, wages of printers	$4,627 51	
Brown Bros., paper, etc	2,087 93	
Buntin, Reid Co., paper, etc	255 83	
Barber & Ellis, paper. etc	316 53	
Canada Paper Co., paper	217 78	
West & Gillis, binding	300 92	
Lincoln Paper Mills, paper	60 04	
Knapp Envelope Co., envelopes, paper, etc	60 80	
Howard Smith Paper Co., paper	319 78	
W. J. Gage Co., paper, etc	45 67	
Telfer Manufacturing Co., paper, etc	77 24	
R. G. McLean, printing and binding	1,502 92	
Copp, Clark Co., paper, etc	12 00	
Canada Printing Ink Co., ink, etc	18 40	
Hubbs & Howe Co., paper, etc	76 56	
Lawson & Wilson, binding	132 61	
Grand & Toy, books, etc	28 56	
Alexander Anderson, printing, etc	157 50	
Miln-Bingham Printing Co., printing	13 50	
Mail Job Printing Co., printing	7 50	
Moore Bros., printing	22 00	
Whaley, Royce & Co., printing, etc	19 45	
Standard Embossing Co., embossing	63 40	
Legg Bros. Engraving Co., engraving	31 09	
Littlejohn & Vaughan, morticing, etc	10 65	
Kilgour Bros., supplies	5 17	
Miller & Richard, supplies	19 57	
Art Metropole, drawing paper, etc	48 68	
Alexander & Cable Lithographing Co., lithographing	6 00	
Rolph Clark Co., lithographing, etc	83 00	
Alexander Engraving Co., zincs, etc	7 28	
David Smith Engraving Co., engraving	53 50	
W. A. Blashford, ruling and binding	132 05	
Ault & Wiborg, ink, etc	7 00	
John Haddon & Co., supplies	1 31	
C. W. Mack, rubber stamps	2 55	
R. E. Walker & Co., supplies	7 88	
Office Specialty Mfg. Co., fyles, etc	8 53	
G. & J. Murray, oil and benzine	4 05	
Edward Carroll, grinding knives	2 00	
Aikenhead Hardware Co., hardware	8 35	
Elliott Mfg. Co., tubes	7 00	
H. Jewell, drawing cut	10 00	
Rice Lewis & Son, hardware	2 95	
Mackenzie & Co., supplies	1 00	
Cohen Bros., supplies	2 00	
Toronto Lithographing Co., cuts	14 00	
A. Welch & Son, stove pipes, etc	6 71	
Breakley's Cartage Agency, cartage	12 70	
J. Hill, cartage	3 35	
J. Haynes, cartage	2 50	
Townsend's Livery, carriage	1 50	
R. Dinnis & Son, carpentry	29 34	
G. M. Bryan, skylight	85 00	
Elias Rogers Co., fuel	48 00	
Atlas Assurance Co., Insurance on paper in hands of binders	5 88	
T. W. Langstone, petty disbursements	23 24	
		$11,118 26

APPENDIX V.

Women's Residence.

1. Subscription Account:			
Balance of fund, 1st July, 1906		$909 37	
Subscriptions received	$25 00		
Received on account of Wild Lands Sales....	3 00	28 00	
Balance at credit of fund, 30th June, 1907			$937 37
2. Housekeeping Account:			
Balance on hand 1st July, 1906		$263 13	
Receipts for rent and board during the year		7,819 60	
Receivable on 30th June, 1907		46 30	
		$8,129 03	
Expenses:			
Brown Bros., meat	$1,190 25		
Swan Bros., groceries	1,282 61		
Park & Thompson, provisions	71 83		
H. R. Reynolds, milk	332 29		
Bredin Bread Coy., bread	193 04		
George Coles, cakes, etc	139 39		
C. Topping, vegetables	177 56		
R. G. Cowan, coffee	39 00		
Ontario Fish Coy., fish	28 51		
Knickerbocker Ice Coy., ice	132 20		
York Mineral Springs, mineral water	80 25		
Michie & Coy., sundries	6 20		
New Method Laundry Coy., laundry	261 78		
Canada Paper Coy., toilet paper	18 61		
Vokes Hardware Coy., hardware	3 33		
G. & J. Murray, oil	4 00		
G. Sparrow & Coy., repairs to range	19 65		
Wheeler & Bain, cleaning furnace, etc	13 33		
W. Younger, repairing chairs	10 20		
W. J. McGuire & Coy., plumbing	23 83		
Hoidge & Sons, plastering	33 21		
G. Duthie & Sons, roofing	1 25		
Toronto Window Cleaning Coy., cleaning windows	5 00		
R. A. L. Gray & Coy., repairing bell	55		
Gourlay, Winter & Leeming, rent of piano.	24 50		
J. Catto & Son, cloth	1 50		
Central Electric Coy. electric supplies....	60		
Toronto Electric Light Coy., electric supplies.	10		
Steel, Briggs Coy., grass seed	75		
University Press, printing	10 63		
John Kay, Son & Coy., stool	1 00		
J. Rossall, attending furnace	2 40		
Miss Fluhmann, nurse's services	132 00		
Mrs. Campbell, to pay servants' wages	1,415 80		
Mrs. Campbell, cash payments	195 23		
Elias Rogers Coy., fuel	1,015 18		
Consumers' Gas Coy., gas	163 75		
Toronto Electric Light Coy., light	150 22		
City Treasurer, water	58 68	7,240 21	
Balance of Housekeeping Account, 30th June, 1907			$888 82
			$1,826 19

APPENDIX VI.

STATEMENT OF EXPENDITURE ON NEW BUILDINGS, YEAR ENDING 30 JUNE, 1907.

1. Convocation Hall:	
R. Robertson, on acct. of contract for masonry	$21,000 00
Dom. Bridge Coy., on acct. of contract for steel	4,845 00
A. B. Coleman, on acct. of contract for carpentry	11,700 00
W. J. Hynes, on acct. of contract for plastering	15,500 00
Wheeler & Bain, on acct. of contract for roofing	1,000 00
Bennett & Wright, on acct. of contract for plumbing	3,900 00
Bennett & Wright, on account of contract for elec. wiring	2,600 00
J. McCausland & Son, on acct. of contract for painting	1,750 00
H. R. Ives & Coy., on acct. of contract for ornamental iron	3,000 00
Luxfer Prism Coy., on acct. of contract for terrazo floors	2,850 00
W. J. McGuire & Coy., on acct. of contract for heating and ventilation	6,850 00
Oxley Enos Coy., on acct. of contract for lighting fixtures	1,800 00
H. J. Harwood, on acct. of contract for seating	8,781 53
A. B. Coleman, boring holes for chairs	89 08
R. Robertson, boring holes for chairs	134 04
R. Simpson Coy., covers for seats	310 00
Roofers' Supply Coy., asbestos	87 64
Pease Heating Coy., temporary heating	125 00
Elias Rogers Coy., fuel for temporary heating	304 18
Darling & Pearson, on acct. of Architects' fees	2,000 00
Ross & Holgate, on acct. of Engineers' fees	700 00
	$89,326 47
Expended to 30 June, 1906	74,547 82
Amount of account on 30 June, 1907	$163,874 29
2. Physics Building:	
R. Robertson, on acct. of general contract	$91,500 00
Babcock & Wilcox, on acct. of contract for boilers	8,393 75
Waterous Engine Coy., on acct. of contract for ash conveyor	1,711 50
Canadian Westinghouse Coy., acct of contract for generators, &c.	6,961 50
Bennett & Wright, acct. of contract for heating and ventilation	6,000 00
P. Lahee, acct. of contract for lighting and special wiring	3,933 50
Dom. Bridge Coy., acct. of contract for crane	556 50
Purdy, Mansell & Coy., acct. of contract for power house piping	2,500 00
Darling Bros., acct. of contract for power house pumps	231 25
Darling & Pearson, acct. of Archtects' fees	6,000 00
Ross & Holgate, acct. of Engineers' fees	8,000 00
Consumers' Gas Coy., mains	317 63
W. J. McGuire & Coy., water supply	194 14
R. Robertson, culverts	28 05
Elias Rogers Coy., fuel for steam tests	35 27
	$136,363 09
Less contractors' deposit, Bennett & Wright	2,161 25
Amount of acct on 30 June, 1907	$134,201 84
3 Women's Residence:	
J. J. Brennan, papering and decorating	$105 00
McGregor & McIntyre, fire escapes	326 00
G. B. Meadows Coy., iron fence	205 00
A. Gardner & Coy., concrete walks	80 00
	$716 00
Expended to 30 June, 1906	29,413 32
Amount of account on 30 June, 1907	$30,129 32

THIRTY-THIRD ANNUAL REPORT

OF THE

Ontario Agricultural College

AND

Experimental Farm

1907

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO)

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1908

Printed by WARWICK BRO'S & RUTTER, Limited, Printers,
TORONTO.

To the Honourable SIR WILLIAM MORTIMER CLARK, K.C.,
Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

I have the pleasure to present herewith for the consideration of your Honour the Report of the Ontario Agricultural College for 1907.

Respectfully submitted,

NELSON MONTEITH,

Minister of Agriculture.

TORONTO, 1908.

THE ONTARIO AGRICULTURAL COLLEGE, GUELPH, ONT.

Hon. Nelson Monteith, *Minister of Agriculture Toronto, Ont.*

FACULTY OF INSTRUCTION, 1908.

G. C. Creelman, B.S.A., M.S.....President.
H. H. Dean, B.S.A.....Professor of Dairy Husbandry.
C. A. Zavitz, B.S.A.....Professor of Field Husbandry.
J. Hugo Reed, V.S.....Professor of Veterinary Science.
H. L. Hutt, B.S.A.....Professor of Landscape Gardening.
G. E. Day, B.S.A.....Professor of Animal Husbandry.
J. B. Reynolds, B.A.....Professor of English.
R. Harcourt, B.S.A.....Professor of Chemistry.
John Evans.....Professor of Manual Training.
S. B. McCready, B.A.....Professor of Botany and Nature Study.
S. F. Edwards, M.Sc.....Professor of Bacteriology.
C. J. S. Bethune, M.A., D.C.L.....Professor of Entomology and Zoology.
W. R. Graham, B.S.A.....Professor of Poultry Husbandry.
W. P. Gamble, B.S.A.....Professor of Soil Chemistry.
H. R. Rowsome.....Lecturer in Apiculture.
T. D. Jarvis, B.S.A.....Lecturer in Entomology and Zoology.
W. H. Day, B.A.....Lecturer in Physics.
John Buchanan, B.S.A.....Lecturer in Field Husbandry.
E. J. Zavitz, B.A., M.S.F.....Lecturer in Forestry.
J. W. Crow, B.S.A.....Lecturer in Horticulture.
R. W. Wade, B.S.A.....Lecturer in Animal Husbandry.
B. Barlow, B.S.....Lecturer in Bacteriology.
H. H. LeDrew, B.S.A.....Lecturer in Economics.
E. W. Kendall.....Demonstrator in Manual Training.
H. L. Fulmer, B.S.A.....Demonstrator in Chemistry.
J. W. Eastham, B.S.....Demonstrator in Botany.
J. E. Howitt, M.S.A.....Demonstrator in Botany.
C. C. Thom, B.S.A.....Demonstrator in Physics.
W. Hunt.....Instructor in Floriculture.
R. W. Stratton.....Demonstrator on Cream Separators and in Buttermaking.
G. R. Taylor.....Demonstrator in Milk Testing.
C. H. Ralph.....Demonstrator in Cheese Making.
Edith C. Dwight, B.A.....Instructor in French and German, Acting Librarian.
R. R. Graham, B.A.....Dean of Residence and Instructor in English.
Miss M. A. Purdy.....Demonstrator in Chemistry.
M. F. Coglan, B.S.A.....Fellow in Chemistry.
W. R. Reeds.....Instructor in Athletics.

Macdonald Institute.

Miss M. U. Watson.....Director of Home Economics.
Annie Ross, M.D.....Instructor in Physiology, Home Nursing, Psychology, and Child Study.
Miss Helen Given.....Instructor in Domestic Science.
Miss Grace Greenwood.....Instructor in Normal Methods.
Miss Rosemina Greist.....Instructor in Domestic Art.
Miss Edna Ferguson.....Demonstrator in Domestic Science.
Miss Evelyn Allan.....Demonstrator in Laundry and Household Administration.
Miss Ethel Fonda.....Demonstrator in Domestic Art.
Captain Clark.....Instructor in Drill and Gymnastics.

Office Staff.

S. Springer.....Bursar.
J. B. Fairbairn.....Secretary.

Physician.

W. O. Stewart, M.D.

ONTARIO AGRICULTURAL COLLEGE

AND

EXPERIMENTAL FARM

FOR THE YEAR 1907.

To the Honorable the Minister of Agriculture:

SIR,—I have the honor to transmit herewith the thirty-third annual report of the Ontario Agricultural College and Experimental Farm, including the report of the Macdonald Institute.

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I have the honor to be, Sir,

Your obedient servant,

G. C. CREELMAN,
President.

GUELPH, Dec. 31st, 1907.

ONTARIO AGRICULTURAL COLLEGE

PART I.

THE PRESIDENT.

The year 1907 shows a larger attendance at the Ontario Agricultural College than ever before in its history, namely, 1,077 students in all departments. This means that the classes have been larger and the work of the professors, lecturers, demonstrators, and other officers increased. All of these persons have worked faithfully and well, and we believe that each year the Course is being materially strengthened.

Changes in the Staff.

It seems impossible to go through a year in an institution of this kind without many changes in the teaching staff of the College. A number of our young men are constantly being offered better positions eslewhere and it is only because of their loyalty to the institution and to their country that more of them do not accept tempting offers made them from different States of the American Union.

The following changes have taken place during this year:

Mr. H. S. Arkell, Lecturer in Animal Husbandry, left in June to accept the position of Professor of Animal Husbandry, in Macdonald College, St. Anne de Bellevue, Que. We feel that we are fortunate in securing as his successor here Mr. R. W. Wade, one of our own graduates, who during the past two years has been Professor of Agriculture at the State Agricultural College, Fayetteville, Arkansas.

Mr. H. S. Peart, Lecturer in Horticulture, was selected by the Department early in the year to take charge of the new Fruit Experimental Farm at Jordan Harbor. He was succeeded in the work here by another of our graduates, Mr. J. W. Crow.

Mr. G. G. White, Fellow in Chemistry, was, during the summer, appointed to a lucrative postion in the department of Chemistry and Physics in the Manitoba Agricultural College; and one of our 1907 men, Mr. M. F. Coglan, was appointed to his place here.

Mr. D. H. Jones, who so efficiently filled the position of Resident-Master for two years, resigned to go back into the Fourth Year to finish his Course. He was succeeded by Mr. R. R. Graham of the present Graduating Class.

Miss A. G. Rowsome, who for many years has been in charge of the Library and also Instructor in French and German, left to accept a larger salary at the Macdonald College in Quebec. She was succeeded by Miss E. C. Dwight, B.A., of Victoria University.

For many years we have been looking to the establishment of a department of Economics. At the beginning of the present College year such a department was organized, with Mr. H. H. LeDrew, B.S.A., in charge in the capacity of Lecturer. Mr. LeDrew is one of our most promising

graduates, and has been doing special work in Economics during the last two years at the University of Chicago. He comes to us well recommended and has already aroused a good deal of enthusiasm among the students taking his work.

Home Economics.

From year to year this department is finding more favor with the people of Ontario. Each of the Classes has been well filled and for the coming term every room in Macdonald Hall has been assigned.

We have even had to clear out the store-rooms and convert them into bed-rooms, in order to accommodate the number of students who have applied. When filled to its capacity the Hall accommodates 116 young ladies.

In the Staff two changes occurred during the year. Miss E. Bigelow, Instructor in Laundry and Household Administration, resigned and is now on the staff of the Macdonald College. Miss Bigelow was succeeded by Miss Evelyn Allan, a graduate of this year. Miss Allan has also a First-Class Teacher's Certificate from the Education Department at Toronto.

Even since Macdonald Institute opened we have had on the Curriculum a most popular Course of three months in Domestic Science. This is repeated three times each year and each Class has been well attended: During the last year there has come a demand for a similar course of instruction in Domestic Art, including sewing and millinery work. This has now been established, with Miss Greist in charge, and she has this year been supplied with an assistant in the person of Miss Ethel Fonda, and the Course is meeting with favor.

A New Departure.

In the department of Chemistry there has been added equipment for flour testing. Up to this time the millers of the Province have had to send samples of flour to Chicago, in order to find out the relative strength of the different grades. Now it is done here, and one of our Macdonald Institute graduates has the matter in charge under the Professor of Chemistry. So far as I can learn, the millers are well pleased with the present arrangement, and the Instructor, Miss M. A. Purdy, seems to be well fitted for her work.

College Work and Progress.

The work of the different departments of the College has gone on pretty much as usual during the past year. The boys' dormitory was again filled and new rooms for forty more students added this year are already spoken for after the Christmas vacation. This will mean 220 boys in Residence.

The bulletins prepared during the year by members of the College Staff and published by the Department of Agriculture are as follows:

153. "Fertilizers and Their Use," by R. Harcourt.
154. "Insecticides and Fungicides," by R. Harcourt and H. L. Fulmer.
155. "Farm Forestry," by E. J. Zavitz.
156. "Tillage and Rotation," by W. H. Day.
158. "Insects Affecting Fruit Trees," by C. J. S. Bethune.
159. "Milking Machines," by H. H. Dean and S. F. Edwards.

Short Courses.

Short Courses continue to be very popular. During the past year the attendance in these Courses totalled as follows: Two Weeks' Course in Stock

and Seed Judging, 302; Four Weeks' Course in Poultry Raising, 24; Three Months' Course in Dairying, 63; One Month Course in Domestic Science, 11; One Month Course in Manual Training, 15; and One Month Course in Nature Study, 30.

Stock Judging at Chicago.

For each of two years we have reported five students from our Senior Class as having won the trophy for judging cattle, sheep, and swine at the great International Live Stock Exposition in the city of Chicago. This had to be won three times, however, before coming into the permanent possession of any institution. It gives me the greatest possible pleasure at this time to record the fact that a new team of students again won the trophy in December and it will now occupy a permanent place in the College reading-room.

Our boys further distinguished themselves by standing first over all competitors in the Sheep Class, and second in Cattle, and second in Swine.

The names and addresses of the students composing the team are as follows:

E. S. Archibald, Wolfville, N.S.
T. R. Arkell, Arkell, Ont.
L. A. Bowes, Meaford, Ont.
R. L. Hodson, Myrtle, Ont.
D. McKenzie, Port Elgin, Ont.

Excursions.

Again the farmers came to us in large numbers during the month of June. Each day was occupied with from one to three excursions and the farmers seemed as much interested as ever in the work of the different departments.

At Macdonald Institute the women were entertained and instructed with practical demonstrations in cooking by members of the Institute Staff.

The College has also become popular as a meeting place for different organizations directly or indirectly interested in our work. During the year the following Associations held meetings here:

May 22 and 23, East Huron Teachers' Association.
June 29, American Chemical Society.
July 4 and 5, Canadian Entomological Society.
Aug. 15, Canadian Association of Master Bakers.
September. 26 and 27, N. Wellington Teachers' Association.
Oct. 3 and 4, N. Simcoe Teachers' Association.
Oct. 31 and Nov. 1, Canadian Entomological Society.

Women's Institutes.

On December 11 and 12 we had again the pleasure of welcoming to the College delegates from the different Women's Institutes of the Province. The meetings this year were larger than ever, more than 500 women attending the sessions daily, and much good must result from the splendid papers read and the discussions which followed. It looks now as if something were going to be really done to materially improve the farm homes of the Province.

Experimental Union.

A large number of ex-students returned to the meeting of the Experimental Union, December 9, 10, and 11. Mr. C. A. Zavitz, who has been

Secretary of the Union since it organized, had, in addition to the work of the Union, many interesting things to say in reference to his trip last year through the United States and Great Britain.

On the evening of the 10th, at the College Boys' Supper, we had the pleasure of entertaining, as the guest of the College, the distinguished President of the University of Toronto, Dr. R. A. Falconer. He delivered a stirring address before the 500 persons who sat down to supper, representing the student, staff, and graduating body. The address was heartily appreciated by all those in attendance.

Graduating Class.

Of this year's graduating class the majority are engaged in farming, and the following are the names of some of those who secured positions away from home:

Agriculture.

Barton, H., Lecturer in Animal Husbandry, Macdonald College, Que.
Crow, J. W., Lecturer in Horticulture, O.A.C., Guelph.
Coglan, M. F., Fellow in Chemistry, O.A.C., Guelph.
Diaz, Pelayo, Lecturer in Agriculture, Buenos Ayres, Arg. Rep.
Hamer, R. S., Instructor in Agriculture, High School, Perth.
Hartman, W. J., Lecturer in Animal Husbandry, Bozeman, Montana.
Hart, F. C., Instructor in Agriculture, High School, Galt, Ont.
Jacobs, W. S., Professor of Animal Husbandry, Fayetteville, Arkansas.
McKenney, Angus, Instructor in Agriculture, High School, Essex.
Mills, R. W., Assistant in Experimental Department, O.A.C., Guelph.
Reed, F. H., Instructor in Agriculture, High School, Lindsay, Ont.
Sanders, G. E., Assistant in Horticultural Department, College of Agriculture, Urbana, Ill.
Scott, H.W., Farm Manager, Yardley, Pa.
Squirrel, W. J., Assistant in Experimental Dept., O.A.C., Guelph.

Domestic Science.

Miss M. E. Allan, Instructor in Laundry Work and Household Administration, Macdonald Institute, O.A.C., Guelph.

Miss E. M. Burns, Teacher of Domestic Science, Public School, Ingersoll, Ont.

Miss Grace Dutcher, Housekeeper in a Settlement, Buffalo, N.Y.

Miss C. E. Elliott, Assistant in Flour Testing Department, Ogilvie Milling Co., Montreal, Que.

Miss Edith MacKenzie, Teacher of Domestic Science, Ladies' College, Halifax, N.S.

Miss Kate McLennan, Lecturer in Domestic Science, Y.W.C.A., Montreal.

Miss M. C. McManus, Teacher of Domestic Science Classes in Public and High Schools, Renfrew, Ont.

Miss N. M. Mortimer, Housekeeper in General Hospital, Vancouver, B.C.

Miss R. Murdock, Housekeeper, Presbyterian Hospital of Alleghany and Pittsburg, Alleghany, Pa.

Miss F. A. Twiss, Teacher of Domestic Science, Galt, Ont.

Miss E. Warner, Experimentalist in Bread Making, Ogilvie Milling Co., Montreal, Que.

Buildings Erected During 1907.

The large addition to the Chemical Laboratory is now completed and gives facility for more and better work in that department. A number of classes from Macdonald Institute are taking practical chemistry and they are now splendidly accommodated in this new wing of the building.

The addition to the College Residence is ready for occupation and all the rooms will be filled after the Christmas vacation.

The new water tower, 100 feet high, on which is situated a water tank 20 feet high with a capacity of 50,000 gallons, was erected during the year. This gives us good water supply for all of the departments and additional fire protection for all of our buildings.

Glass houses have been built and equipped in connection with the departments of Entomology, Physics, and Botany. These should make the work in these departments still more practical and useful.

There is now in process of construction a new coal bin to hold 3,000 tons of coal. This has been almost a necessity for some time, as we have been piling our coal in large heaps on the surface up to this time, as the original coal bin soon became very much too small for our needs.

An entire new roof has been placed on the old College Residence, not before it was needed, as the old roof was leaking in many places.

Outside Lectures.

A number of excellent lectures were delivered before the members of our student body in Massey Hall at regular intervals during the year. These lectures proved very interesting and instructive, and we are obliged to these ladies and gentlemen for the assistance they have rendered to us:

Miss H. M. Hill, Toronto, Ont.—"Travel Talk."

Mr. W. D. Hobson, Woodstock, Ont.—"Bird Lore."

Dr. A. B. McCallum, Toronto, Ont.—"Victoria Falls and Uganda."

Prof. W. A. Parks, Toronto, Ont.—"Ontario Northland, including Cobalt."

Mr. W. E. Saunders, London, Ont.—"Bird Lore."

Mr. E. S. Williamson, Toronto, Ont.—"An Evening with Dickens."

Mr. Frank Yeigh, Toronto, Ont.—"Twentieth Century Canada."

Dr. Woods, Teachers' College, Columbia University, New York—"Physical Education."

Agriculture in Our High Schools.

A significant movement in connection with agricultural education has been inaugurated this year. Your Deputy, Mr. James, the Superintendent of Education, Dr. Seath, and myself, had a number of conferences on the subject of introducing agriculture into the educational system of the Province, and it was finally decided to make the experiment in six of our high schools. Money was voted for the purpose by the Government and the schools of Perth, Morrisburg, and Lindsay in the East and Collingwood, Galt, and Essex in the West were selected. I was instructed to recommend six young men, graduates of the College, for the work, and the following received their appointments to the places named:

R. S. Hamer, Perth High School.

W. A. Munro, Morrisburg High School.

F. H. Reed, Lindsay High School.

R. E. Mortimer, Collingwood High School.
F. C. Hart, Galt High School.
A. McKenney, Essex High School.

At the annual meeting of the Experimental Union in December each of these young men made a report of the work he was attempting to do. The Minister and Deputy Minister of Agriculture were present, and they, as well as the entire audience, were impressed with the possibility of good work being done through these departments.

By arrangement with the Minister of Education and the Minister of Agriculture, I have been appointed to inspect these departments during the coming year, and I hope to have something to report later on.

STUDENTS OF THE YEAR.

Attendance.

General Course	358	
Specials in General Course Work	18	
Manual Training	29	
Dairy Courses	63	
Short Courses in Stock and Seed Judging	302	
Short Courses in Poultry Raising	24	
		794

At Macdonald Institute.

Domestic Science	243	
Nature Study	40	
		283
Total		1,077

There were also 124 children from the Public Schools who received instruction in Domestic Science at Macdonald Institute.

Analysis of College Roll (General Course), 1907.

From Ontario.

Brant	8	Muskoka	2
Bruce	7	Northumberland	1
Carleton	6	Norfolk	2
Dufferin	5	Nipissing	2
Dundas	2	Ontario	6
Durham	2	Oxford	7
Elgin	4	Perth	6
Essex	3	Peel	3
Frontenac	3	Prescott	2
Grey	4	Parry Sound	2
Glengarry	3	Peterboro	2
Grenville	3	Russell	2
Hastings	5	Renfrew	1
Halton	13	Simcoe	8
Haldimand	3	Stormont	1
Huron	3	Victoria	4
Kent	2	Wentworth	9
Leeds	1	Welland	6
Lanark	1	Wellington	19
Lambton	6	Waterloo	9
Lincoln	7	York	38
Lennox	2		
Middlesex	14		

From other Provinces of the Dominion.

Alberta	5	Nova Scotia	12
British Columbia	12	P. E. Island	3
Manitoba	3	Quebec	7
New Brunswick	4	Saskatchewan	3

From other Countries.

Argentine Rep	9	Japan	3
Belgium	1	Jamaica	2
England	29	Mexico	1
Egypt	1	Scotland	8
France	1	South Africa	1
Germany	1	Spain	2
Ireland	3	U. S. A.	24
India	2		

Ages and Religious Denominations.

The limits of age of students in the General Course, 1907, ranged from 16 to 39 years. The average age was 20.

Presbyterian	115	No Religion	3
Methodist	100	Hinduism	2
Episcopalian	71	Unitarian	2
Baptist	33	Mennonite	2
Roman Catholic	23	Dutch Reform	2
Congregational	7	Christadelphian	1
Friends	6	P. Brethren	1
United Brethren	3	Quaker	1
Disciple	3	Jewish	1

Bachelors of the Science of Agriculture.

Barton, H.	Vankleek Hill, Ont.	McKenney, A.	Corinth, Ont.
Binnie, T. H.	Bunessan, Ont.	McVannel, A. P.	St. Marys.
Bower, J. E.	Harriston.	Mills, R. W.	Toronto, Ont.
Bunting, T. G.	St. Catharines, Ont.	Nixon, C. C.	St. George, Ont.
Crow, J. W.	Welland, Ont.	Prittie, F. H.	Toronto, Ont.
Coglan, M. F.	Bath, Ont.	Reed, F. H.	Georgetown, Ont.
Diaz, P.	Ferrol, Spain.	Sanders, G. E.	Roundhill, N. S.
Hamer, R. S.	Toronto, Ont.	Scott, H. W.	Lancaster, Ont.
Hart, F. C.	Sackville, N. S.	Squirrell, W. J.	Guelph, Ont.
Hartman, W. J.	Woodbridge, Ont.	Twigg, C. B.	Dungannon, Ireland.
Hudson, H F.	Essex, England.	Wheeler, H. C.	Hubbard, Ohio, U.S.A
Jacobs, W. S.	Toronto, Ont.		

Recipients of Associate Diploma.

Allen, R. J.	Guelph, Ont.	Laughland, Jas.	Hartney, Man.
Angle, P. E.	Forks Road, Ont.	Law, I. F. M.	Solina, Ont.
Bell, D. T.	Glanford Station, Ont.	Lawrence, C. A.	Stratford, Ont.
Brownridge, J. W.	Hornby, Ont.	LeClair, J. M.	Ste. Therese, Que.
Campbell, A. D.	Strathroy, Ont.	Lewis, F. G.	Lindsay, California.
Campbell, J. A.	Lawrence Station, Ont.	McEwen, E. F.	Byron, Ont.
Campbell, M.	Zimmerman, Ont.	McGill, H. W.	Everett, Ont.
Coke, E. F.	Lyndhurst, Mihi Gulley, Jamaica.	McKenzie, N. D.	Galt, Ont.
		McKenzie, D.	Vancouver, B. C.
Cooley, R. B.	Canifton, Ont.	McLaren, A.	Edinburgh, Scotland.
Cooper, H. S.	Toronto, Ont.	McRae, D. E.	Cumberland, Ont.
Cunningham, G. C.	Oil Springs, Ont.	Manton, G.	Eglinton, Ont.
Cutler, G. H.	Birnam, Ont.	Mills, R. W.	Toronto, Ont.
Diaz, G.	Ferrol, Spain.	Moore, R. R.	Norwich, Ont.
Duff, H. C.	Dobbington.	Oliver, D. M.	Toronto, Ont.
Duffy, C.	Nauwigewauk, N. B.	Palmer, B. G.	Norwich, Ont.
Edwards, W. E. J.	Balsam, Ont.	Palmer, W. E.	Marshville, Ont.
Hamer, R. S.	Toronto, Ont.	Ryan, W.	Surrey, England.
Hebert, G.	St. Albert, Alta.	Shopland, N. J.	Saanich, B. C.
Hartman, W. J.	Woodbridge, Ont.	Sirett, H.	Rosseau, Ont.
Hodgins, E. L.	Portage du Fort, Que.	Smye, G. C.	Ayr, Ont.
Hoy, B.	South Swansea, Mass.	Strong, W.	Guelph, Ont.
Irvine, W. H.	Habermeal, Ont.	Thompson, W. R.	London, Ont.
Iwanami, J.	Kofer, Japan.	Treherne, R. C.	O. A. C., Guelph, Ont.
Jackson, W. D.	Fulton, Ont.	Tweltridge, T. H.	Notts, England.
James, J. L.	Argentine Republic.	Waddell, W. M.	Strathroy, Ont.
Jenkinson, R. H.	Toronto, Ont.	Webster, H. B.	Science Hill, Ont.

First Class Men.

The work of the College is divided into Departments, and all candidates who obtain an aggregate of seventy-five per cent. of the marks allotted to the subjects in any department, are ranked as first class men in that department. The following list contains the names of those who gained a first class rank in the different departments at the examinations held in April, 1907, arranged alphabetically:

First Year.

Aldwinckle, E. W., in one department, Chemistry and Physics.

Beaupre, F. C., in two departments, Chemistry and Physics, and Biology.

Christie, H. R., in two departments, English and Mathematics, Chemistry and Physics.

Faulds, T. B., in two departments, English and Mathematics and Biology.

Ferguson, C., in one department, English and Mathematics.

French, P. E., in one department, English and Mathematics.

Heurtley, E. W., in one department, English and Mathematics.

Kennedy, S., in one department, Chemistry and Physics.

LeLacheur, G., in four departments, English and Mathematics, Chemistry and Physics, Biology, and Agriculture.

Newhall, H. W., in two departments, English and Mathematics, Chemistry and Physics.

Reek, W. R., in four departments, English and Mathematics, Chemistry and Physics, Biology, and Agriculture.

Robertson, C. L., in one department, Chemistry and Physics.

Shaw, A. M., in one department, English and Mathematics.

Todd, S. E., in one department, English and Mathematics.

White, O. C., in one department, English and Mathematics.

Wilson, S., in two departments, English and Mathematics, Chemistry and Physics.

Second Year.

Allen, R. J., in one department, English and Mathematics.

Angle, P. E., in one department, English and Mathematics.

Jackson, W. D., in one department, Biology.

McEwen, C. F., in one department, English and Mathematics.

McLaren, A., in three departments, English and Mathematics, Chemistry and Physics, and Biology.

Sirett, H., in three departments, English and Mathematics, Chemistry and Physics, and Biology.

Stafford, E. W., in one department, English and Mathematics.

Strong, W., in one department, English and Mathematics.

Turney, A. G., in one department, English and Mathematics.

Webster, H. B., in two departments, English and Mathematics, Chemistry and Physics.

Scholarships.

Scholarships of $20 each in money were awarded for groups of subjects in first year work as follows: Highest standing with a minimum of forty per cent. of the marks for each subject, and an aggregate of seventy-five per cent. of the total number of marks allotted to the subjects in the group:

English and Mathematics.—H. R. Christie, Amherst, N.S.

Physical Science.—H. W. Newhall, Toledo, Ohio, U.S.A.

Biological Science.—W. R. Reek, Romney, Ont.

Agricultural Science.—G. LeLacheur, Murray Harbor, South, P. E. Island.

PRIZES.—SECOND YEAR.

Prizes amounting to $10 each, in books, were given as follows:

First in General Proficiency, First and Second Year work, Theory and Practice,—H. Sirett, Rosseau, Ontario.

Essay,—"Ontario as a place of residence and a sphere of livelihood".—A. G. Turney, Saventhen, Belgium.

MEDAL.—SECOND YEAR.

Governor-General's Silver Medal,—First in General Proficiency. First and Second Year work, 1906-1907.—H. Sirett, Rosseau, Ontario.

PROFESSIONAL DAIRY SCHOOL CERTIFICATES ISSUED DURING 1907.

Baxter, J. P.	Mackinac, Man.	Buttermaking.
Fockler, P.	Eganville, Ont.	Buttermaking.
McLean, Alex.	Lorneville, Ont.	Buttermaking.
Reid, Wm.	Camlachie, Ont.	Cheesemaking.

CONCLUSION.

The reports of the different departments of College work will be found further on in this volume; so that I shall not point out in detail any of the work which is being done in our laboratories and class-rooms, as this is specially outlined in the reports which follow.

I have the honor to be,

Your obedient servant,

GUELPH, Dec. 31, 1907. G. C. CREELMAN.

FINANCIAL STATEMENT, 1907.

COLLEGE DEPARTMENT.

EXPENDITURE.

Salaries and wages	$54,663 05
Meat, bread, groceries, laundry, engine room supplies and fuel	27,734 24
Advertising, printing, postage and stationery	3,951 52
Maintenance, 5 laboratories	2,992 72
Expenses, short courses	973 54
Travelling expenses and extra lectures	1,076 77
Library	2,748 91
Scholarships	90 00
Telephone service, rent, etc.	388 65
Contingencies	1,255 86
Furnishings and repairs	3,872 87
Sewage	480 00
School assessment, S. S. No. 7	89 20
Temporary assistance	977 34
Student labor	4,342 58
Total expenditure	$105,637 25
Less Revenue	24,599 23
Net expenditure	$81,038 02

REVENUE.

Board	$16,683 34
Tuition and Laboratory Fees	6,672 50
Supplemental Examinations	117 00
Rent of Post Office boxes	41 50
Fines and breakages	481 27
Rent of Rooms	144 50
Rent of Cottages	240 00
Chemical Laboratory Analyses	75 50
Sale of wood	28 50
" old carpenter shop frame	50 00
" old implement shed	50 00
" small potatoes	3 20
" meteorological supplies	11 92
Total Revenue	$24,599 23

STUDENT LABOR.

Total Per Month.		*To What Department.*	
January	$487 53	College Department	$318 85
February	355 41	Chemical Laboratory	141 62
March	321 52	Botanical Laboratory	36 55
April	164 57	Bacteriological Laboratory	17 03
May	428 61	Physical Laboratory	297 92
June	320 72	Entomological Laboratory	59 88
July	251 35	Macdonald Institute	30 11
August	214 19	Nature Study Laboratory	6 48
September	371 52	Farm Department	875 24
October	704 74	Experimental Department	713 09
November and December	722 42	Dairy Department	47 10
		Dairy School Department	23 09
		Poultry Department	655 43
		Horticultural Department	614 44
		Mechanical Department	505 75
	$4,342 58		$4,342 58

MACDONALD INSTITUTE AND HALL.

EXPENDITURE.

Salaries and wages	$13,843 00
Servants' Pay list	1,856 40
Bread, meat, groceries, furnishings, repairs, engine room supplies and fuel, and labor on grounds	11,827 46
Maintenance of laboratories in Institute	2,995 95
Library and stationery	582 78
Total Expenditure	$31,105 59
Less revenue	15,234 90
Net expenditure	$15,870 69

REVENUE.

Board	$10,802 50
Tuition and laboratory fees	4,303 50
Supplemental examinations	2 00
Sale of supplies to nature study students	14 10
Sale of supplies to manual training students	3 20
Fines and breakages	109 60
Total revenue	$15,234 90

FORESTRY DEPARTMENT.

Expenditure.

Wages, trees, seeds, furnishings, repairs, etc	$3,997 26

FARM DEPARTMENT.

Expenditure.

Permanent Improvements	$493 87
Wages of men and foreman	5,995 01
Purchase of Live Stock	7,164 11
Maintenance of Stock	2,559 92
Farm maintenance (including repairs, blacksmithing, binder twine, seed, furnishings, fuel, light, advertising, printing, stationery, tools, implements, etc.)	2,397 54
Contingencies	337 06
Total expenditure	$18,947 51
Less revenue	7,678 11
Net expenditure	$11,269 40

N.B.—Nothing allowed the Farm Department for the feed, etc., of the Department horses, and supplies for the College and Macdonald Hall, including milk.

Revenue.

Sale of Cattle:		
28 Steers, 39,183 lbs. at from $5.10 to $7.50	$2,133 56	
5 Steers for	230 00	
7 Bulls for	471 55	
20 cows for	819 00	
2 Heifers for	75 00	
23 Calves for	441 50	
		$4,170 61
Sale of Pigs:		
147 Hogs, 28,827 lbs. at from 5c. to 8½c.	$1,807 01	
1 Boar	15 00	
10 Sows for	191 00	
		2,013 01
Sale of Sheep:		
8 Sheep for	$87 00	
15 Lambs for	152 05	
		239 05
Service of animals		112 00
Sale of wool, 292 lbs. at from 15½c. to 17½c.		47 83
" one old horse		85 00
" one old mower		10 00
" one old seed drill		10 00
" one load hay		5 00
" 16 bags potatoes		8 00
Sale of Grain:		
153¾ bush. Barley at 70c.	$107 62	
19 bush. Wheat at $1.00	19 00	
3 " Wheat at $1.25	3 75	
14 " Oats at 50c.	7 00	
2 " Corn at $1.00	2 00	
		139 37
Sale of 48 bags at 20c.	$9 60	
" 20 bags at 25c.	5 00	
		14 60
Sale of Milk:		
9,978½ qts. at 4c.	$399 14	
Sale of milk to Dairy	424 50	
		823 64
		$7,678 11

EXPERIMENTAL DEPARTMENT.

Expenditure.

Permanent improvements	$599 77
Assistant, Specialist in plant breeding, stenographer, foreman, teamsters and laborers	7,259 82
Seeds, manure and special fertilizers	544 55
Furnishings, implements, repairs, blacksmithing, etc.	558 17
Printing, postage, stationery, contingencies, etc.	323 68
Total expenditure	$9,285 99

DAIRY DEPARTMENT.

Expenditure.

Permanent improvements	$486 56
Wages, including foreman, cheesemaker, buttermaker, engineer, stenographer and bookkeeper	2,295 00
Milk for experimental cheese and buttermaking	11,891 36
Furniture, furnishings, repairs, etc., laboratory expenses, gas chemicals, etc., and contingencies	749 11
Fuel and light	366 34
Total expenditure	$15,788 37
Less revenue	15,630 05
Net expenditure	$158 32

Revenue.

Sale of Butter, 55,257 lbs. at from 15c to 35c	$13,566 22
" Cheese, 11,338¼ lbs. at from 5c. to 15c	1,379 39
" Cream, 2,229¼ qts. at from 15c to 30c	443 60
" Milk, 37½ qts. at 4c	1 50
" 5,334 lbs. at $1.60 cwt	85 34
" Buttermilk, 20,220 lbs. at 25c. cwt	50 55
" Sundries	3 45
Rent of House	100 00
Total revenue	$15,630 05

DAIRY SCHOOL DEPARTMENT.

Expenditure.

Permanent improvements, cement floors, walks, etc.	$206 23
Wages of instructors, engineer, janitor, stenographer and bookkeeper	1,605 00
Cleaning, painting, repairs and contingencies	217 65
Dairy appliances, separators, vats, expenses, cheese and butter judges inspecting factories, etc.	493 60
Advertising, printing, postage, stationery, books, papers, etc.	163 47
Fuel and light	579 40
Purchase of milk for use in school	4,275 65
Total expenditure	$7,541 00
Less revenue	3,573 73
Net expenditure	$3,967 27

REVENUE.

Fees		$92 00
Breakages		3 95
Sale of butter, 10,729 lbs. at from 23c. to 30c.		2,984 84
" Cheese, 2,852 1-3 lbs at from 8c to 15c.		368 29
" Cream, 593½ qts. at 20c.		118 70
Sundries:—Milk tests, 95c.; 1 tester pump, $5.00		5 95
Total revenue		$3,573 73

POULTRY DEPARTMENT.

EXPENDITURE.

Permanent improvements		$104 31
Wages of assistant, stenographer and temporary assistance		793 40
Furnishings and repairs		479 35
Purchase of stock		199 48
Fuel, light and contingencies		323 79
Experiments with incubator, fattening and feed		1,897 39
Total expenditure		$3,797 72
Less revenue		1,475 39
Net expenditure		$2,322 33

REVENUE.

Sale of eggs for hatching:		
2,770 eggs at from 3c. to 5c.	$132 84	
179 1-6 settings at from 75c. to $1.50	189 25	
		322 09
Sale of eggs for domestic use:		
1,683¾ doz. at from 10c. to 35c.		353 85
Sale of live poultry, 166 birds at from 50c. to $5		218 90
Sale of dressed poultry, 3,699 1-12 lbs. at from 8c. to 20c.	$450 25	
2 pair chickens for	2 10	
1 goose	1 10	
197 broilers at from 25c. to 50c.	61 20	
109 ducks at from 40c. to 50c.	53 80	
35 squabs at from 20c. to 25c.	8 35	
		576 80
Sale of feathers: 13 lbs. at from 25c. to 30c.		3 75
Total revenue		$1,475 39

HORTICULTURAL DEPARTMENT.

EXPENDITURE.

Permanent improvements	$208 58
Head gardener and foreman florist, assistant in plant breeding, assistant and night fireman, teamsters, assistant gardener, stenographer and laborers	5,758 07
Manure, trees, plants, bulbs, cold storage experiments, implements, tools and contingencies	1,499 24
Fuel and light	647 22
Wax fruit models	397 50
Purchase of horse	200 00
Total expenditure	$8,710 61
Less revenue	154 51
Net expenditure	$8,556 10

Note. Products supplied to College except when more than required.

REVENUE.

Sale of Cabbage	$7 02
Sale of Onions	13 46
Sale of Parsley	5 25
Sale of Berries	96 18
Sale of Cucumbers	29 52
Sale of Tomatoes	3 08
Total revenue	$154 51

MECHANICAL DEPARTMENT.

EXPENDITURE.

Salary of foreman	$800 00
Tools, fuel and light	145 85
Total expenditure	$945 85

SUMMARY, 1907.

	Expenditure	Revenue	Net Expend.
College Expenditure	105637 25	24599 23	81038 02
Forestry Expenditure	3997 26	.....	3997 26
Macdonald Inst. & Hall Expenditure	31105 59	15234 90	15870 69
	$140740 10	39834 13	100905 97
Farm Expenditure	18947 51	7678 11	11269 40
Experimental Expenditure	9285 99	.....	9285 99
Dairy Expenditure	15788 37	15630 05	158 32
Dairy School Expenditure	7541 00	3573 73	3967 27
Poultry Expenditure	3797 72	1475 39	2322 38
Horticultural Expenditure	8710 61	154 51	8556 10
Mechanical Expenditure	945 85	.....	945 85
	$65017 05	28511 79	36505 26
Total Net Expenditure, College	100905 97		
Total Net Expenditure, Farm	36505 26		
Total Net Expenditure	$137411 23		

Yours truly,

S. SPRINGER,

Bursar and Superintendent.

PART II.

THE DEAN OF RESIDENCE.

To the President of the Ontario Agricultural College:

Sir,—I have the honor to submit herewith my first report, as Dean of the Residence, for the year ending December 31st, 1907.

As I assumed the duties of Resident Master on the 1st of October of this year, I am very largely indebted to Mr. D. H. Jones, my predecessor, for the contents of this report. Much to his credit, too, I found conditions within and about the Residence most favorable for the good health, and the comfort, progress, and happiness of the students.

My duties require me to conduct roll-call and prayers, preside in the dining hall, see that the students observe study hours, and that they maintain order throughout the college halls at all times. Then, too, I see that the rooms and halls are kept clean and tidy and in good repair, and the dormitories always comfortable and congenial to study.

At present there are 171 students in the Residence. Owing to the increased attendance this year about 80 students are obliged to board outside, mainly down town, but when the new extension to the Residence is ready at Christmas time we will be able to take in about 40 of these men.

During the summer vacation the main building was repaired and improved considerably, most of the old roof was replaced by a new metal one which had been badly needed for some time; the dormitories and corridors were thoroughly cleaned and white-washed or painted, and new armchairs were provided for the students. Then, too, No. 1 classroom and the small room adjacent to it were converted into a large, cheerful, and most comfortable sittting room. Here the students spend much of their spare time in study, reading, and enjoying music and song. It certainly fills a long felt want in Residence life.

The matter of fire protection is being given increased attention. Fire extinguishers are conveniently placed throughout the halls, and have been found to be in good working order, and proved to be very efficient. The fire escapes are in good condition and red night lights are being installed in the corridors at the exits to fire escapes and stairways.

In conclusion, I must say that the character of the student body is of a very high order. The general health is good, there being throughout the year no diseases except colds, tonsilitis and la grippe. This, I believe is largely due to an increased interest in and attention to the gymnasium work by the students. They also are studious in their habits, manly in their conduct, courteous in their manners, and are becoming more and more self-governing each year. I have adopted the principles that actuated my predecessors in preserving good discipline in the Residence, and I feel sure that I have the sympathy and co-operation of the student body in my endeavours to apply them.

Respectfully submitted,

ROBT. R. GRAHAM.

PART III.

PROFESSOR OF ENGLISH.

To the President of the Ontario Agricultural College:

Sir,—I have the honor to submit herewith my thirteenth annual report in the department of English.

My report this year is necessarily brief. It is impossible to present new material year after year in reporting merely on the teaching of a subject. Our course with the Agricultural students covers four years; and with the Normal classes in Domestic Science our course covers two years, and is identical with the First and Second years in English at the University of Toronto. Besides these two courses, we have a one year course with the Homemaker class at the Macdonald Institute.

No remarks are necessary with respect to the division of the work in English coming under the head of English Literature. While our selections vary from year to year, my experience has taught me that the present amount of work in reading authors is about right for each of the classes at the College. It is gratifying to be able to say that the students generally display marked interest and appreciation for the best English authors after one or two years of training. I wish, however, to add a few remarks respecting other branches of the work in English.

English grammar, as a separate subject, is not taught here. The omission of this subject from our course has been decided upon after some years' experience in the results of teaching it. My conclusion is that the men who come here are, for the most part, not young enough to afford the time to spend on the study of English grammar. In other words, the ultimate purpose of the course can be served more expeditiously by teaching other branches of English than English grammar. Occasionally, of course, the rules of grammar are referred to in the English classes, but only incidentally. If the student is not well acquainted with English grammar before coming here, he must continue to be ignorant of it, or must pick it up incidentally or by his own efforts.

In the matter of composition, we are trying to increase the amount of work that is done by the students, as well as to improve the manner of teaching it. There is no subject, perhaps, that is more tedious and less interesting in itself to a class of students than that of composition. At the same time, there is hardly any subject that is of more general uefulness to the student at any institution of learning. A few years ago the only composition exercises required of the students at this College were the Second Year theses, to be handed in at the end of the second year. It is obvious that such an amount of practice and a corresponding amount of instruction is altogether too little to serve the needs of our students here. We have for some years been attempting to make the work in composition effective. To this end we have tried several methods and have come to the conclusion that there is no method so effective as to assign definite subjects, to mention a definite time for the composition to be handed in, and to read carefully every composition thus handed in. Such

a procedure involves an enormous amount of work on the part of the instructor, but in no other way can he so thoroughly become acquainted with the students' needs and deficiencies in this particular. We are now giving to the students of the First and Second years weekly exercises, consisting of short papers on assigned subjects. The same principle of assigning compositions and reading them carefully is applied to all classes at the institution. After they have been read, the general features of these papers are discussed with the class with a view to emphasizing the qualities of a good composition. In addition to this, two or three times during the year the students are requested to call at the room of the instructor for their papers, and each student is interviewed and his paper is discussed with him in detail. We think with these various means we are giving the students good opportunities for improvement in this direction. The chief objection to these methods, from our point of view, is that they consume a large amount of time, an amount of time in proportion to the number of students and to the amount of work done by each student.

For the past few years classes in Public Speaking, or Practical English, as they are called, have been conducted under the supervision of this department. It is a question whether such work belongs more to the instructor in English or to the instructor in elocution. Some of the students seem to want such lessons as will emphasize the elocutionary features of speaking rather than the literary. It is needless to say that, so far as the English department is concerned, the literary aspect of speaking is considered chiefly. I believe, however, that if by any means lessons on the voice, inflection, gesture, and platform etiquette, as it may be called, could be given, they would prove a benefit to our students; in fact, in the senior years the students are beginning to feel the need of just such instruction.

This year Mr. H. H. Le Drew has supplied the place of Assistant in English formerly taken by Mr. D. H. Jones. Mr. Le Drew, while at the University of Chicago last summer, took some special lessons on teaching composition, and I may say that he is doing excellent work in this direction. He has been assigning the topics for short weekly papers from the students of the first two years, and is attending to the work of reading these papers very conscientiously. Mr. Le Drew's time and attention are partly taken up by his own special subject, Economics, and in future he is likely to be more and more occupied with that subject. It will be necessary to consider, in the near future, some arrangement whereby this important work of composition with the First and Second Years may be under the care of a man who can give it undivided attention. I am thoroughly satisfied that the importance of this work will justify such provision.

The additions to the Library on behalf of the department of English have again been both liberal and judiciously selected.

Respectfully submitted,

J. B. REYNOLDS.

PART IV.

THE LECTURER IN PHYSICS.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit herewith my second report as head of the department of Physics.

INSTRUCTION.

(*a*) *Lecture Courses.*

In the first year the instruction in the department consists of courses in Arithmetic, Hydrostatics as a preparation for and followed by Soil Physics, and lastly a course in the principles of Mechanics. The work of the second year consists of Surveying, Drainage, and Farm Power by electricity, wind and water. The third year make a specialty of Meteorology, Cold Storage, and Ventilation, based upon a thorough course in Heat. In the final year, Climatology, advanced Drainage, and advanced Soil Physics are emphasized.

(*b*) *Laboratory Work.*

Laboratory practice is given all the years in the various subjects. There is one change that I would respectfully submit for your consideration, viz., that the present practical work in Soil Physics, instead of coming in the fourth year, be transferred to the second year. This work illustrates and impresses the elementary and fundamental principles that govern the securing of proper soil conditions. Under existing arrangements, men completing the diploma course and not returning for the degree have little or no practical work in this subject, though such a course would enable them to grasp more fully the importance of the physical properties of the soil such as moisture, heat, air, and sanitary conditions; and not only to grasp their importance, but to control them by adapting actual tillage operations to the producing of the desired conditions. This change would not necessitate any more time—merely a rearrangement of our present time—but it would necessitate the fitting up of a portion of the present laboratory space specially for work in Soil Physics. In the fourth year, we are unable to do any advanced work on this subject, because all the time at the disposal of the class is taken up with the elementary experiments which are necessary before problems more involved can be undertaken. Under the proposed rearrangement, the elementary work could be covered in the second year, leaving the final year free for the laboratory study of more advanced problems.

WEATHER REPORT FOR 1907.

Weather records have been kept at Guelph and other stations as in previous years. The results are given in Tables I. to IV.

Table I. Weather Report of 1907 at the O. A. C., Guelph.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Mean temperatures	19.1	18.5	29.2	38.7	48.6	61.4	66.4	68.7	62.7	42.8	33.1	25.3	42.9
Departure from normal	+.3	—.5	+2.5	—2.8	—4.9	—1.7	—1.6	+2.4	+2.9	—3.4	—.8	+.5	—.5
Lowest temperatures	—8.0	—15.0	2.0	22.0	25.0	40.0	44.0	42.0	38.0	22.0	8.0	6.0	—15.0
Highest temperature	48.0	56.0	66.0	64.0	78.5	87.0	85.0	91.5	81.5	71.0	59.0	44.5	91.5
Snowfall in inches	4.3	6.7	2.8	2.0	.....	.....	.....	.....	.....	.....	3.0	8.0	26.8
Rainfall in inches	.96	.22	.45	1.46	2.64	1.11	1.92	.62	2.87	3.15	4.77	2.16	23.43
*Precipitation in inches	1.39	.89	.73	1.66	2.64	1.11	1.92	.62	2.87	3 15	5.07	2.96	26.11
Departure from normal	+.01	—.67	—.63	+.09	+.33	—1.83	—1.04	—1.56	+.56	+.74	+2.92	+1.25	+.53

*Calculated by ten inches snow being equivalent to one inch of rain.

Table II. Temperatures at Outside Stations.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Maitland	12.6	6.7	2.8	37.2	47.4	63.7	64.5	64.3	61.5	43.4	34.9	22.4	38.5
Magnetawan	13.9	6.0	24.3	31.5	41.8	60.3	64.1	59.9	54.3	37.8	28.7	19.9	36.9
Marksville	13.1	9.3	25.9	30.2	42.2	60.2	64.0	59.2	63.4	40.5	32.3	21.9	38.5
Bay View, P. E. I.	14.9	11.8	21.2	34.4	43.7	53.8	60.3	60.4	55.2	43.7	36.4	28.9	38.7
St. Catharines	.....	17.9	34.1	37.9	41.8	62.7	70.0	66.2	63.9	46.8	38.0	31.1	46.4
Leamington	26.1	20.9	37.5	38.6	49.0	63.3	71.4	67.7	61.7	47.2	38.5	29.9	46.2
Highest Temperatures.													
Maitland	47.0	40.0	60.0	69.0	76.0	83.0	88.0	86.0	80.0	70.0	58.0	43.0	88.0
Magnetawan	49.0	34.0	53.5	57.5	77.0	84.5	84.0	86.0	79.5	66.5	50.0	43.0	86.0
Marksville	42.0	39.0	55.0	51.0	63.0	90.0	82.0	82.0	79.0	70.0	49.0	38.0	90.0
Bay View, P. E. I.	52.5	55.0	45.0	66.0	72 0	86.0	79.0	78.0	76.0	65.0	59.0	57.0	86.0
St. Catharines	.....	48.0	66.0	76.0	82.0	87.0	89 0	92.5	91.0	77.0	58.0	53.0	92.5
Leamington	53.0	42.0	70.0	74.0	75.0	87.0	87.0	87.0	84.0	74.0	53.0	49.0	87.0
Lowest Temperatures.													
Maitland	—20.0	—20.0	—4.0	16.0	26.0	43.0	48.0	44.0	46.0	21.0	10.0	—2.0	—20.0
Magnetawan	—28.5	—36.5	—18.0	4.0	6.5	33.5	34.5	35.0	28.5	12.0	5.5	—10.	—36.5
Marksville	—26.0	—30.0	—16.0	1.0	21.0	37.0	42.0	38.0	30.0	17.0	6.0	—5.00	—30.0
Bay View, P. E. I.	—12.0	—12.0	—16.2	4.0	28.0	31.8	49.3	43.0	30.0	30.0	19.0	11.0	—16.2
St. Catharines	.....	—1.5	7.0	21.5	27.0	41.0	41.5	44.0	40.0	23.5	21.0	17.0	—1.5
Leamington	—.4	—.5	10.0	14.0	29.0	42.0	41.0	45.0	37.0	26.0	19.0	10.0	—.5

Table III. Precipitation at Outside Stations.

Precipitation.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct	Nov.	Dec.	Year
Maitland.													
Rain	1.81	0.	2.34	2.82	2.71	2.62	1.11	.52	3.78	2.45	3.41	2.73	26.30
Snow	5.25	6.75	0.	1.50	0.	0.	0.	0.	0.	0.	0.	11.5	25.00
Precipitation, rain	2.34	.67	2.34	2.97	2.71	2.62	1.11	.52	3.78	2.45	3.41	3.88	28.80
Magnetawan.													
Rain	1.21	0.	1.69	.84	1.42	1.99	1.65	1.74	3.36	2.83	2.01	.55	19.29
Snow	15.10	20.3	9.50	17.1	2.7	0.	0.	0.	0.	0.	16.5	21.9	103.1
Precipitation, rain	2.72	2.03	2.64	2.55	1.69	1.99	1.65	1.74	3.36	2.83	3.66	2.74	29.60
Marksville.													
Rain	.40	0.	.87	.10	2.95	3.12	3.15	4.96	4.91	2.69	1.58	1.35	26.08
Snow	26.0	13.0	14.0	.80	6.0	0.	0.	0.	0.	0.	7.0	0.	66.8
Precipitation, rain	3.00	1.30	2.27	.18	3.55	3.12	3.15	4.96	4.91	2.69	2.28	1.35	32.76
Bay View, P. E. I.													
Rain	1.02	.43	.08	.35	2.35	1.04	7.14	4.92	6.47	4.40	2.13	2.07	32.40
Snow	26.8	34.12	22.0	26.5	4.80	0.	0.	0.	0.	2.10	3.00	15.00	134.32
Precipitation, rain	3.70	3.84	2.28	3.00	2.83	1.04	7.14	4.92	6.47	4.61	2.43	3.57	45.83
St. Catharines.													
Rain	.....	.28	2.73	1.33	2.92	1.75	1.97	1.53	3.35	2.61	2.70	3.11	24.28
Snow	.....	12.5	3.00	0.	1.5	0.	0.	0.	0.	0.	0.	15.55	32.55
Precipitation, rain	.....	1.53	3.03	1.33	3.07	1.75	1.97	1.53	3.35	2.61	2.70	4.66	27.53
Leamington.													
Rain	3.99	.74	2.34	1.97	2.27	4.77	2.46	1.17	4.86	2.57	2.47	2.47	37.08
Snow	14.0	7.0	0.	.25	.5	0.	0.	0.	0.	0.	0.	0.0	21.75
Precipitation, rain	5.39	1.44	2.34	1.99	2.32	4.77	2.46	1.17	4.86	2.57	2.47	2.47	39.25

Table IV. Length of Season at Various Stations.

Station.	Last killing frost in Spring.		First killing frost in Autumn.		No. of days between.	Average length of season free from killing frost.
	Date.	Deg.	Date.	Deg.	1907	
Guelph	May 20th	.....	Oct. 20th	.....	153	*145 (20)
Maitland	May 11th	26.0	Oct. 9th	28.0	151	150 (2)
Magnetawan	May 30th	27.0	Sept. 26th	28.5	119	112 (2)
Marksville	May 30th	30.0	Sept. 26th	30.0	119	122 (2)
Bay View, P. E. I	May 12th	28.0	Sept. 29th	30.0	140	.....
St. Catharines	May 12th	27.0	Oct. 21st	25.0	162	.....
Leamington	May 21st	29.0	Oct. 21st	26.0	153	.....

* Numbers in b ackets denote number of years from which averages is taken.

Damage by Lightning in 1907.

Reports of damage by lightning have been collected this year as previously. The results are given in Tables V. to VIII.

Table V. Buildings Struck in 1907.

How reported.	Barns.				Houses.				Others.			
	Burned.	Damaged.	Totals.	Loss.	Burned.	Damaged.	Totals.	Loss.	Burned.	Damaged.	Totals.	Loss.
Personally	22	9	31	53,548	1	6	7	1,257	2	1	3	35,885
Newspapers	22	8	30	*51,763	4	8	12	*2,012	2	8	10	**
Totals	44	17	61	105,311	5	14	19	3,269	4	9	13	35,885

*Loss at same rate as on those personally reported.

**One of the losses personally reported being a large packing house valued at $30,250 and the remainder being all small buildings, the loss on the latter could not be taken as proportional.

Total estimated loss on barns, houses and other buildings, $144,465.

Table VI. Animals Struck.

Animals.	In field.	By fence.	Under tree.	In shelter of steel roller.	In or near building.	Location not reported.	Totals 1907.	Totals 1901-1907.
Cattle	6	1	12	.....	1	9	29	222
Sheep	.....	1	5	.....	.....	.....	6	137
Horses	1	.....	4	.....	3	2	10	71
Pigs	.....	.....	.....	8	.....	1	9	21

Table VII. Summary of Trees Struck from 1901-1907.

Year.	Elm.	Pine.	Oak.	Maple.	Apple.	Basswood.	Poplar.	Ash.	Willow.	Cedar.	Hemlock.	Balsam.	Spruce.	Chestnut.	Hickory.	Birch.	Beech.	Butternut.	Fir.	Walnut.	Pear.	Thorn.	Total.
1901	7	8	1	2	..	5	..	..	..	..	2	..	..	1	..	..	..	..	..	..	..	..	26
1902	6	1	5	4	..	2	1	2	1	..	..	1	..	..	1	..	1	..	..	..	..	..	25
1903	3	3	1	..	1	..	1	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	13
1904	6	4	1	..	2	..	2	1	..	..	..	..	..	..	..	..	..	1	..	..	..	..	17
1905	4	1	1	1	..	..	..	..	..	3	..	..	1	..	..	..	..	..	1	..	..	..	13
1906	7	5	6	3	5	..	2	..	3	1	2	2	2	1	..	2	..	..	..	1	1	..	43
1907	5	3	..	..	..	..	1	1	..	..	..	1	1	..	1	..	..	..	..	..	..	1	14
Totals	40	25	15	10	8	7	6	5	5	4	4	4	4	2	2	2	1	1	1	1	1	1	151

Table VIII. Other Information Regarding Barns.

Barns personally reported 31.

Windmill.

Mill on or near	8
No mill	21
Not specified	2

Location.

On hill	6
On knoll	6
On plain	13
In valley	2

Distance from railway.

¼ mile	5
½ "	2
1 "	4
2 miles	4
3 "	2
4 "	4
5 "	2
6 "	2
7 "	2
8 "	1
Not specified	

The number of buildings reported is not quite so large as last year, though second largest since 1901, when records were begun.

Of the buildings personally reported, all but one were not protected by lightning-rods. One is doubtful, our correspondent living some distance from the scene and the owner not having yet answered our enquiries.

We sometimes hear it claimed that windmills are dangerous, sometimes that they are a protection. From reports we cannot conclude either way, for taking the country over, many more buildings are without mills than with them; likewise most of the barns struck have none.

The same reasoning applies to location. No site seems to be immune from stroke.

We have heard it claimed that buildings near railways were more liable to stroke. The reports would seem to lend some strength to this claim, but no settled conclusion can be drawn.

Drainage Surveying.

Believing as we did, and still do, that the drainage surveying being done by the department of Physics is the most important work before it today except instruction to students, an active campaign was planned at the beginning of the year. During the winter months a series of articles on farm drainage operations were written for the *Farmers' Advocate* in the hope of creating a wider interest in underdrainage and a better undrstanding of its importance. Close upon this followed the announcement in the leading dailies of the Province and in some two hundred and twenty-five weeklies that the department was prepared to give practical demonstration of methods of surveying land for drainage purposes, laying out the drains and determin-

ing the grades, and size of tile—the same announcement that had been made for two years past. The response was much more general than in previous years, the applications for assistance coming in very rapidly. There were besides so many enquiries as to methods of operation in drainage work that the correspondence became very heavy, to relieve which a small pamphlet on "Farm Drainage Operations" was issued. Some conception of the growing interest in the subject may be gained when we state that the whole issue of 1,000 copies has been distributed and that almost entirely in response to direct applications for it. Believing that the information contained in it may be of some interest, it is given farther on in this report.

Altogether we received 126 applications for instruction in drainage work, a few of which have come in since the season closed. Of these 70 were attended to, of which 34 were done by Mr. Thom, 11 by Mr. Wolverton, and 25 by myself. Several affected more than one person, so that, all told, we aided in laying out drains on 107 farms. In all 102 days' work were necessary, or nearly one day per farm; and besides this time actually spent surveying, there was the time spent in travelling and in making out in rough the plans for the various drains. One draftsman was busy all summer making finished copies of these plans, which were supplied to the respective owners. Realizing early in the season that Mr. Thom and I would be unable to reach all our applicants, representation was made to you and you were generous enough to provide us with an extra man for one month, in the person of Mr. H. A. Wolverton, who rendered good and satisfactory service. Still there were some 56 applications that we were unable to attend to. The applicants were written to and asked if they wished their names placed on next year's lists. Some twenty-four have signified their desire to have us visit them next spring.

The educational side of this work needs special mention. We make it a point to instruct every man in the methods used, so that in future problems he will be able to run his own drains and also work out the grades and determine the size of tiles. Each man who is thus possessed of the power to solve a drainage problem becomes an example to his neighbors, who learn from him the methods he uses. The aggregate value of one hundred centres of drainage instruction can scarcely be over-estimated. There are hundreds of thousands of acres now practically valueless which will be reclaimed and become the best land in the country, as a result of this instruction in drainage. Hence, as I said in the beginning, I look upon this drainage work as the most important before the department, except that of actual instruction of the students at the College. For these reasons I would commend to your consideration the suggestion that the staff of the department be increased by one permanent man as demonstrator, whose first duty shall be the demonstration to the farmers of the Province of the operations of drainage surveying. This work would continue through eight months of the year from April to November inclusive; during the remaining four his time to be devoted to investigation work, and assistance in the general work of the department.

The pamphlet previously referred to, with some slight additions, follows.

FARM DRAINAGE OPERATIONS.

(Issued by the Department of Physics, Ontario Agricultural College, Guelph.)

About two years ago, at the suggestion of Professor Reynolds, the Minister of Agriculture authorized the department of Physics at the College to send out representatives among the farmers to give advice on drainage to those requesting it. The response to this offer of assistance has been very gratifying indeed. During the autumn of 1905, and the whole season of 1906 many farms were visited and surveyed, completely or in part, and the owners furnished with maps showing them the elevations of the different parts of their farms, the slope of the land, the proper outlets, and the

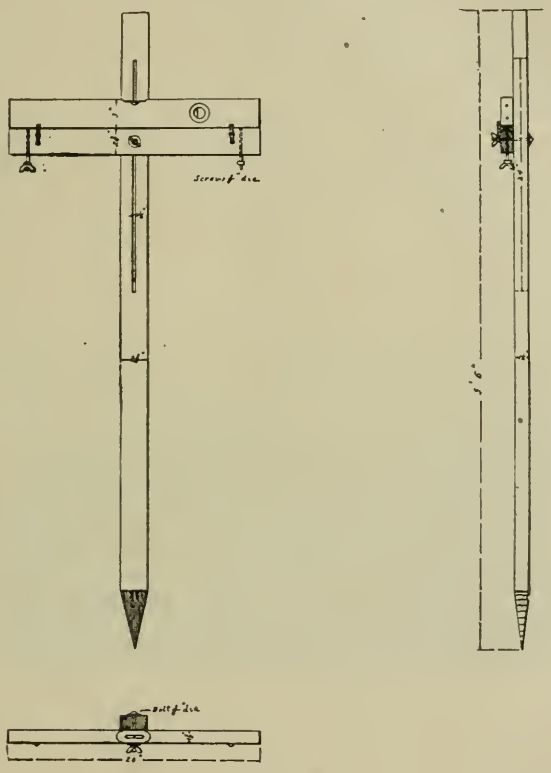


Fig. 1.

A Home-Made Drainage Level.

best plan for draining the various slopes. This spring has witnessed a vast extension of the work. With all this information at hand, however, they have still to construct their drains. We have found various methods in use. Some have been digging by the water test—the grade was right when the water would run—but this meant a wet ditch bottom, and very mussy, disagreeable work. Sometimes the work had to be stopped for want of water. Others had been digging by the carpenter's level laid upon a board in the ditch, the bubble being displaced the same amount each half board-length the grade was uniform, still others by the triangle or T square and plumb-

bob. But sometimes they "lost fall" and ran their ditch to the surface too soon. Not knowing the total fall from the upper end to the outlet, the grade was not properly chosen.

Nearly every one for whom we do surveying wishes to know our methods of construction. It is the purpose of this pamphlet to give these methods.

We begin by finding the fall over the drain. The first requisite is a level adapted to finding the difference in elevation between two points. Figure I represents a home-made drainage level. It consists of:

(1) An upright piece of wood 5.5 feet high, 3 inches wide, and 1.5 inches thick, and sharpened at the bottom, and with a slot 2.5 feet long, beginning within six inches of the top.

(2) A cross-piece bolted to the upright by a bolt through the slot; washers at head and nut. The cross-piece may be rotated about its centre.

(3) A long carpenter's level with *straight* top sitting on the cross-piece, held loosely in position by two buttons.

(4) Two wood screws with thumb-head, passing through the cross-piece and touching the bottom of the level.

When the instrument is to be used, the upright is sunk *firmly* into the ground as nearly perpendicular as possible. The level is levelled roughly by tilting the cross-piece, and then the thumb-screws are used for more accurate adjustment, either end of the level may be raised a little, as needed, by the screws at the end. The photograph shows the level in use. It requires two men to operate it, A to sight, B to carry the measuring pole or staff and note the fall or rise from one place to another.

Determining the Fall over the Ditch.

Determining the Fall over the Ditch.

When the location of the ditch has been decided on, it should be staked out with three or four stakes six or eight feet high, to plow by when digging is begun. They will be removed when the first furrow is plowed. Then the length of the drain should be determined. If a 66-foot tape is used in measuring, a short stake, say three feet long, should be set up every 66 feet along the ditch, but these should be set *three or four feet to one side of the ditch*, so that they will not be disturbed by the plow—they will be needed later. If a 100-foot tape is used, these stakes would be placed 100 feet apart. We use a 100-foot tape. For convenience the stakes may be numbered 0, 100, 200, 300, etc.; stake 0 being at the outlet, stake 100 being 100 feet from the outlet, stake 200 being 200 feet from the outlet, etc. Measurements and digging are usually begun at the outlet.

When the drain is staked we are ready to determine the fall. The level is set up *about half way between stake 0 and stake 100* and levelled, the cross-piece being in line with the stakes. B stands the staff at stake 0 and places his pencil across it (as shown in photograph), and A sights over the level directing B to raise or lower the pencil until it is in line with the level. B notes the height of the pencil on the staff, say 4 feet 10 inches, for illustration, and then moves the staff to the next stake, number 100, *the level remaining in the same position.* A now sights forward to the staff and B places the pencil the proper height, as before, say 4 feet 1 inch.

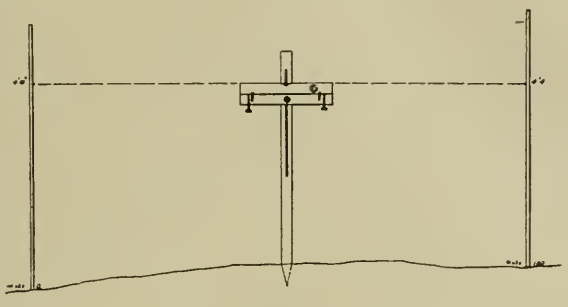


Fig. 2.

It is easily seen from figure 2 that the difference of nine inches between the two readings, 4 feet 10 inches and 4 feet 1 inch, is the rise from stake 0 to stake 100. The level may now be moved about halfway between stake 100 and stake 200, *the staff remaining at stake 100,* and the fall from 100 to 200 determined as in the first section. This is continued the full length of the drain.

Observe again that if the fall or rise between two points is to be found the level is set up *about half way between them* and readings taken *back* to one and *forward* to the other, *the level remaining stationary throughout.* The readings are recorded in a note-book suitable for the purpose, and the fall or rise between any two succeeding stations is found by simply *subtracting the back sight of one station from the foresight of the next* or vice versa. Don't bother with the height of the level, it is unnecessary and confusing. The heading of each page tells which drain the notes on that page refer to. The following is suggested as a suitable form for the notes.

NOTES ON LATERAL NO. 1.

Stake.	Back sight.		Fore sight.		Fall.		Rise.		Elevation.	
	Feet.	Inches.	Feet.	Inches.	Feet.	Inches.	Feet.	Inches.	Feet.	Inches.
0	4	10	.....		.....		.....		10	0
100	5	2	4	1	.....		0	9	10	9
200	5	3	3	11	.....		1	3	12	0
300	5	0	3	9	.....		1	6	13	6
400	4	6	4	0	.....		1	0	14	6
500	4	7	4	3	.....		0	3	14	9
600	4	5	4	5	.....		0	2	14	11
700	4	7	4	8	0	3	.....		14	8
800	.....		5	3	0	8	.....		14	0

Note that in six out of the eight hundred feet sections there were rises, in the other two there were falls. The six rises total 4 feet 11 inches, and the two falls total 11 inches, hence on the whole there was a rise from stake 0 to stake 800 of 4 feet 11 inches minus 11 inches, equalling 4 feet.

The last column, "elevation," needs a word of explanation. In comparing the altitude of different towns, for instance, we use the sea-level as a datum plane, i.e., a level of comparison. Toronto Bay is 250 feet, the Agricultural College at Guelph 1,150 feet above the sea, from which we learn that the College is 900 feet above the bay. In surveying a ditch we cannot use the sea as a datum, for we do not know how much stake 0 is above the sea, hence we must choose an arbitrary datum. In the example given we have chosen it ten feet below the ground surface at stake 0. Then the elevation of stake 0 above this chosen datum plane is 10 feet. Since there is a rise of 9 inches to stake 100 its elevation would be 10 feet 9 inches, and so on with all the other stakes. To find the fall from any one stake to any other, we have only to subtract the elevation as given in the last column. For instance the rise from stake 0 to stake 800 is 14 feet minus 10 feet, equalling 4 feet, the same as we obtained by subtracting the total falls from the total rises. This last column, while not absolutely essential, is the most convenient method of comparing any one station with any other. If starting our survey at the source instead of at the outlet we would choose for the elevation of the starting point some height greater than the total fall to the outlet.

Determining the Grade of the Ditch.

We find that with the majority of farmers the chief difficulty is the determination of the grades at which they should dig their ditches, hence we give here a method by which they can work this out in advance of their digging and thus know that they are not going to "run out too soon" nor "run too deep." It will possibly take a little study to follow it through, but anyone of average intelligence can do so, and after this is once done he can apply the method.

The different steps may be given as follows:

(1) Procure a piece of co-ordinate or cross-section paper, i.e., paper ruled in large squares one inch to the side and these again into small squares one-tenth or one-twelfth of an inch to the side. This can be procured from any bookseller at five to ten cents a sheet 15 x 20 inches in size. If co-ordinate paper is not to hand a large sheet of foolscap may be ruled with light upright lines and made to answer well. For clearness of reproduction some of these lines have been omitted. (See Fig. 3.)

(2) Let elevations be measured *up and down* on the paper and distances between stakes be measured *right and left.* The datum plane or level of comparison will then be at the bottom of the paper and stake 0 at the left hand side.

(3) Let one large square up and down equal two feet of elevation.

(4) Let one large square right and left equal 100 feet from stake to stake.

(5) Number the stakes along the datum plane as shewn in figure.

(6) At each stake make a dot the proper distance above the datum plane, shewing the elevation of that stake, e.g., at stake 0 in the figure a dot is made 10 feet, i.e., 5 squares, above the datum; at stake 100 a dot is made 10 feet 9 inches, i.e., $5\frac{3}{4}$ squares above the datum; at stake 200 a dot is made 12 feet above the datum; and so on, the proper elevation of each stake being marked.

(7) Join all these dots by a line. This line gives the shape of the ground surface from stake 0 to stake 800, showing at a glance just where the fall is slow or rapid.

(8) At stakes 0 and 800 make dots 3 feet below the surface, indicating a trial depth for the ditch at those points. Then lay a ruler on the paper and draw a line connecting these two dots—see dotted line in figure. This

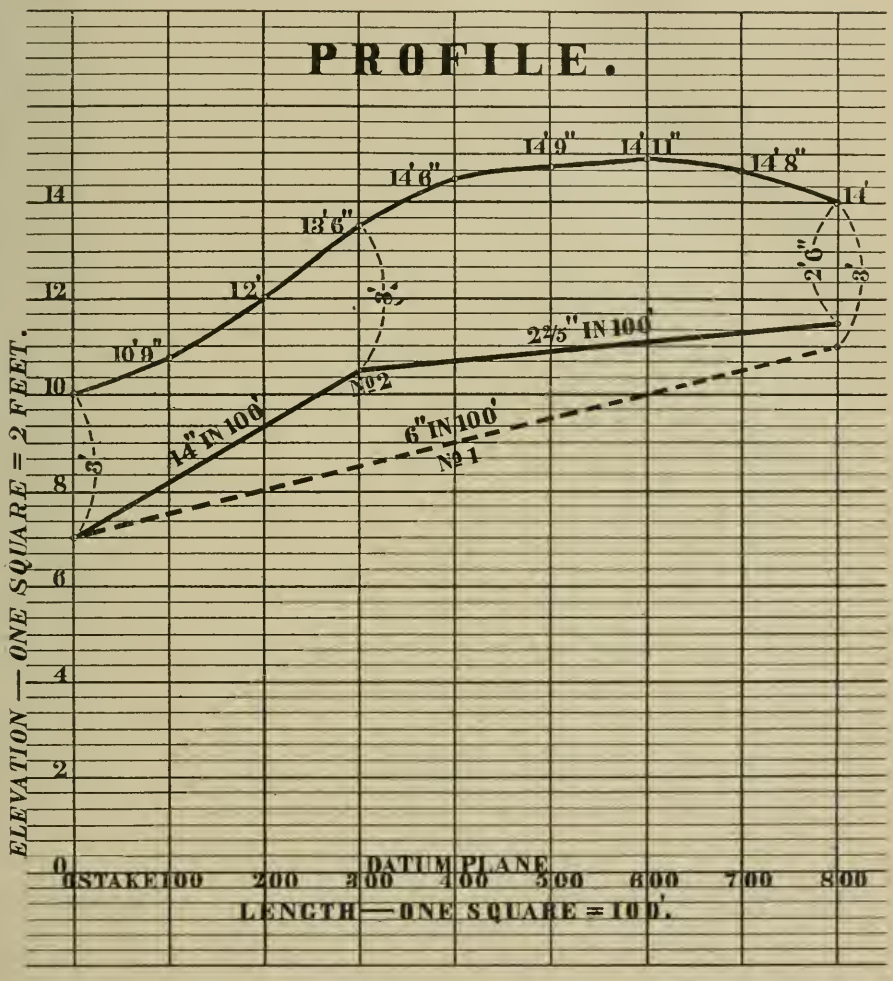


Figure 3. Illustrating method of determining the grade or grades for ditch bottom.

line will show where the ditch bottom would run if the ditch were dug at uniform grade and made 3 feet deep at both ends. By counting the number of spaces between this dotted line and the ground surface at any point, the depth of the ditch at that point can be learned. Applying this test we see that the ditch shown in the figure would be four feet deep or more throughout most of its length, and that it would be five feet or more for over half its length, in some places being 5½ feet. Hence we conclude that it is not advisable to dig this ditch three feet deep at both ends and of uniform grade, if it can be avoided—there is too much digging.

Whether it can be avoided or not depends upon the amount of fall from stake 800 to stake 0. The fall is 4 feet, which is equilavent to a grade of 6 inches in 100 feet. Now this is much steeper than is absolutely essential for effective drainage. The minimum grade for safety is about 2 inches in 100 feet. A drain to be *safe* must have grade enough to give the water a *velocity sufficient to move any sand* that may enter at the joints of the tile. 2 inches in 100 feet will give that velocity and a little to spare. Many tile drains laid on slower grades than this have done and are doing good service, but where there is any possibility of coarse sand entering the tile, they are within the danger zone.

Then, coming back to our problem, we see that we have plenty of fall, hence we can dig the upper section of the drain to a slow grade, and the lower section to a steep grade. Choosing depths of 2 feet 6 inches at stake 800, 3 feet at stake 300 and 3 feet at stake 0 and joining the dots made at these depths, we obtain a new ditch bottom with a change of grade at stake 300, the grade of the upper section being 2 two-fifths inches in 100 feet and of the lower section 14 inches in 100 feet. This is a much more desirable bottom than that shown by the dotted line, the deepest digging being a shade less than four feet, and the shallowest 2 feet 6 inches. The average saving in digging by using bottom No. II rather than No. I, would be almost one foot throughout the entire length of the drain. A similar profile may be made for any drain, once the elevations at the different stakes are known. There is one critical point in each drain, viz., the outlet; knolls and basins where they occur are also critical points—we must take care to choose grades that will not require us to go too deep in the knolls not too shallow in the basins. When striking the grades we consider first the critical points—the others will look after themselves.

(9) To determine the grade on a section of drain when the depth is different at the two ends of the section, we proceed as follows: Subtract the elevation of the ground surface at the two ends (this gives the fall on the surface), and then add or subtract the difference in depth, according to which end is the deeper. For example, the upper section of the drain in figure 3: 14 minus 13 feet 6 inches equals 6 inches, hence in the ground surface there is a fall of 6 inches; but the drain is six inches deeper at stake 300 than at the upper end, hence the fall in the ditch bottom is 6 plus 6, which equals 12 inches in 500 feet; hence the fall per 100 feet equals 12 inches divided by 5, which equals 2 and two-fifths inches.

Use of Plow in Digging Drain.

When the drain has been staked out and the grade determined, one is ready to begin digging. Experience has shown that in the earlier stages the plow can be used to great advantage. Perhaps the most effective method is somewhat as follows:

(1) Using an ordinary plow, open up the drain as wide as possible, throwing one furrow each way. In stubble, fallow or plowed ground these furrows will not need shovelling, as they will be thrown well out; in sod they may need rolling farther back.

(2) Using an ordinary plow, again plow two furrows, one each way, in the bottom of the ditch already formed, throwing each furrow toward the centre of the ditch. The second one will turn the first back partly, but this serves only to loosen the soil more thoroughly. The sides of the ditch, which were very sloping after the first plowing, have been trimmed off perpendicular and straight by the land-side in the second plowing, which is now ready to shovel out; and it will be found in prime condition.

The ditch at the present stage should be about 18 inches wide. It may be objected that this causes needless shovelling, to which I answer that the plow is to be used till the ditch is 2½ feet deep, and it is necessary to have the top wide enough to accommodate the handles. The bottom will not be any wider than necessary.

This operation should be repeated till the ditch is about 15 or 18 inches deep. In order that the horses may walk comfortably, one on each side of the ditch, the lines are opened up as wide as possible and a long doubletree used. To permit the plow to go deep enough in the ground, a chain about six or eight feet long is put in between the beam and the doubletree. This plow will not be found satisfactory after a depth of 15 or 18 inches is reached, as the drain gradually becomes narrower.

(3) Now using a drainage plow of some sort, plow right down the centre of the drain, and come back in the same furrow. This forms a narrow ditch in the bottom, both sides of which are trimmed straight and perpendicular. With a narrow shovel this furrow may now be removed. This operation is repeated again and again until the drain is almost as deep as required.

For this third operation a plow must be fitted up specially—we want something to dig a narrower trench than heretofore. Take an ordinary narrow plow and remove the mould-board. This of course removes the attachment for the lower end of the right handle, but bolt a narrow block between the handles and run a brace from it to the back bolt in the beam, and the handle is as steady and as firm as ever. Put on a new narrow point. If one has much draining to do, it is advised to make further and permanent alterations in the plow used for this third operation. The rod between the handles should be taken out, shortened, and replaced, thus bringing the handles closer together. The top section of the ditch need not then be so wide as before. It is also wise to shorten somewhat the braces that run from the bead to the handles, thus raising the latter; the wide section of the ditch need not be so deep as before.

An ordinary subsoil plow serves very nicely, too, for this third operation, but the best thing I have seen for it is the "pick or pavement plow" manufactured by the Verity Plow Co., of Brantford. In hard ground the home-made drainage plow is very hard to control when the ditch becomes deep—sometimes it goes too deep, at other times, because of its lightness, it skims along the surface, doing no good. The subsoil plow, too, has these defects, and besides it is not strong enough in very heavy soil. I have seen a subsoil plow twisted so out of shape as to be useless for any purpose, and that simply because of the stiffness of the soil and uncontrollability of the plow. The pick plow has none of these defects—it is heavy, and therefore strong enough for all purposes, rides steadily at a uniform depth, and is easily held. Because of its weight it is somewhat cumbersome in turning at the end, but it performs its work so effectively that this slight drawback may be overlooked. This plow is not made primarily for drainage work, but for tearing up pavement, old roads, etc., hence the handles as in an ordinary plow are too low and too wide. But they can be raised and narrowed as described above—which was actually done on the particular pick plow which I saw used for drainage purposes.

This method of digging a ditch is not given as original, but as one that has been tried and has been proven eminently satisfactory. Men of wide experience, who have used various methods, and who have discarded others in favor of this one, assure me that this is the most economical they have tried.

Grading the Ditch.

Having determined the grade and dug the ditch within a few inches of its final depth, the next operation is to remove the remaining earth, leaving the ditch bottom with an even fall throughout. The accompanying drawing will aid in understanding the method to be described:

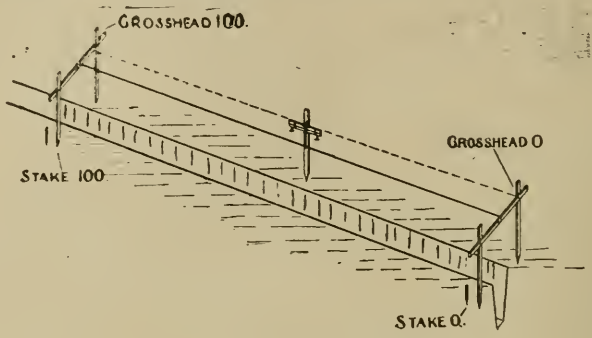


Fig. 4.

Two cross-heads are set up 100 feet apart, one at stake 0 and the other at stake 100, as shown in figure 3. Both are put 7 feet above the ditch bottom, the latter thus being higher than the former by the amount of fall in 100 feet, *e.g.*, if the fall is 14 inches in 100 feet, then cross-head 100 is set just 14 inches higher than cross-head 0. The stakes must be stout and driven firm in the ground. A light cord—binder twine does very well—is then stretched *tight* and tied over the cross-pieces, so that the sag is negligible. Since one end is 14 inches higher than the other, this cord has the same fall as the ditch bottom is to have, and hence if the latter is made parallel to the cord it will have the required fall. It is necessary to provide a light testing stick 7 feet long, since the cord is 7 feet above the ditch bottom. With a narrow shovel the earth is gradually removed until the stick standing on the bottom just passes under the line. When such is the case the ditch is deep enough at that point. When every point between stakes 0 and 100 just tests 7 feet from the overhead line, the grade of this section is uniformly 14 inches in 100 feet. Any other grade is arrived at in a similar way.

But how shall we place the cross-heads 7 feet above the ditch bottom?

First. We must determine the depth of the ditch at the outlet. A drain usually empties into another tile drain or into an open ditch, the depth of either of which may be determined by using the drainage level and the measuring staff as follows: Set up the level as previously directed and sight over it at the staff, which is placed first on the surface of the ground, and second on the bottom of the main drain or of the open drain. Subtracting the readings, we have the depth of the ditch at the outlet. Suppose for illustration that it is 3 feet 5 inches.

Second. We must determine the height the cross-piece is to be placed above the ground. This is done by subtracting the depth of the ditch from the length of the testing stick, *i.e.*, if the ditch is 3 feet 5 inches deep, as supposed above, then cross-head 0 would be 7 feet minus 3 feet 5 inches = 3 feet 7 inches above ground. One end of the cross-piece is clamped to one of the stout stakes at this height (3 feet 7 inches), the cross-piece is then levelled by means of the carpenter's level, and the other end clamped to the other stake.

Third. We must find a point on stake 100 just the same height as the top of cross-head 0. To do this the drainage level is set up about half way between stakes 0 and 100. The level is moved up or down on the standard until when adjusted it is found by sighting (see dotted line) to be just on a level with the top of cross-head 0. Then by sighting toward stake 100, as shown by dotted line, a point is found which is also on same level as the top of cross-head 0. This end of cross-head 100 is clamped just *14 inches higher* than the point shown by dotted line, the cross-head levelled, and the other end clamped. Cross-head 100 is thus exactly 14 inches higher than cross-head 0.

Why have the over-head line *seven* feet above? Six feet is not enough to clear the man and his shovel. Eight feet would be more than is necessary. For any other grade than 14 inches in 100 feet cross-head 100 is clamped the corresponding amount higher than the dotted line. When the first section has been graded, and while the line is still strung, it is wise to lay the tile so that they may be tested to grade by the same line, a notch being cut in the testing stick at a distance from the end equal to the outside diameter of the tile. When the line just meets this notch the tile is in proper grade. After the laying has been finished cross-head 0 is moved to stake 200 and set the required amount higher than cross-head 100 and this section of the drain graded as was the first section.

In practice it is found convenient not to tie the line to the cross-pieces, but to simply pass it over them and tie a stone to it. This keeps the line always at the same tension and takes up any stretch that may occur. As the line sags some on a 100 feet section, it is usually found best to interpose one or two light cross-heads between the end ones. They can be sighted in position by those at the end.

There are numerous devices for aiding in digging a ditch to the required grade, but the overhead line here described is the best I have seen. I know quite a number of practical ditchers who have abandoned others in its favor, but none who have abandoned it for others.

It is not wise to allow the digging to get too far ahead of the laying, as rain is liable to occur at any time, causing the sides to cave in in spots and in other ways interfering with the finished bottom. The joints of large tile should be protected to prevent sediment entering the tile while the earth is becoming set. Sods placed with the grass next the tile are excellent for this purpose. Tar paper also is good. When the drain has been filled a ridge should be plowed over it in a well-rounded crown from eight to twelve inches higher than the land on either side and to a width of eight or ten feet, otherwise large quantities of water are likely to collect over the drain and soak down through the loose soil, sometimes choking the tile with sediment, at other times gradually forming a channel beside the tile, washing the soil away and allowing one or two lengths to roll out of line and thus partially or wholly block the drain.

What Size of Tile to Use.

In every drainage problem we are confronted with the question, "What size of tile shall we use?" a question that cannot be answered off-hand. The amount of water that will flow through a pipe depends upon three factors, the size, the roughness and the slope; so when we are asked what size of tile to use in a given case we must determine first the area to be drained, and secondly the slope—the roughness is a constant factor and already known.

The acreage that various sizes of tile are capable of draining on various slopes has been carefully worked out by McConnel, and his table is subjoined.

Table of Size of Tile Pipe of Main Drain (McConnell).

Fall.	Acres Drained.					
	3-inch tile.	4-inch tile.	6-inch tile.	8-inch tile.	10-inch tile.	12-inch tile.
1 foot in 20	18.6	26.8	74.4	150.0	270.0	426.0
1 " 30	15.1	21.8	60.4	128.0	220.8	346.0
1 " 40	12.9	18.6	51.6	108.8	189.6	298.4
1 " 50	11.9	17.0	47.7	98.0	170.4	269.0
1 " 60	10.9	15.6	43.4	90.0	156.0	246.0
1 " 70	10.0	14.5	39.9	83.0	144.4	228.1
1 " 80	9.3	13.4	37.2	77.0	135.0	213.0
1 " 90	8.1	12.6	35.0	72.5	127.0	200.5
1 " 100	7.3	11.9	33.1	69.2	120.6	190.5
1 " 150	6.7	9.5	26.6	56.0	97.3	154.4
1 " 200	5.7	8.2	22.8	48.0	83.9	132.5
1 " 250	8.1	7.5	20.4	42.4	74.4	117.0
1 " 300	4.6	6.9	18.4	38.2	65.5	107.0
1 " 400	4.1	5.9	16.5	32.6	60.3	90.7
1 " 500	3.7	5.2	14.8	30.1	54.0	81.6
1 " 600	3.3	4.7	13.3	28.0	48.6	74.0
1 " 800	2.9	4.1	11.4	24.0	41.9	65.0
1 " 1000	2.6	3.7	10.2	21.2	37.2	56.0
1 " 1500	2.1	3.0	8.5	16.8	30.8	47.0
1 " 2000	1.9	2.8	7.4	15.0	25.0	40.8

Suppose a man has 12 acres to drain and the slope of his main is 1 foot in 600, then we look down the list of falls till we find 1 foot in 600 and follow this line to the right. A 3-inch tile would not do; it drains only 3.3 acres. A 4-inch tile drains only 4.7 acres. A 5-inch tile, not given, but probably drains about 7 to 9 acres. A 6-inch tile fills the bill, as it is capable of draining 13.3 acres. The size to use for any other slope is determined in the same way. This rule applies to the submains and laterals as well as to mains. Owing to the great amount of friction in small tile compared with the volume of water they can carry, they are much more likely to clog with sediment than are the larger ones, so much so indeed that a 2-inch tile should never be used except on a steep grade. They are almost sure to clog in time on a slow grade.

Depth and Distances Apart.

A mistake that beginners often make is that of putting their drains too shallow. This arises from not understanding fully the action and function of the drain. To begin with, why is it necessary to drain? Because the roots of plants cannot live and thrive in soil containing excessive water. This being so, we must next ask how deep do the roots naturally go in the soil where the conditions as to drainage are perfect? If they go six inches only, then it is sufficient to drain our soil on the surface alone. If they go three feet deep, then for best results we must drain three feet deep. But, again, how deep *do* they go? This varies somewhat with the crop, but the roots of corn, winter wheat, oats, barley and clover, some of our staple crops, penetrate *at least* from three to four feet in average field conditions. Then how deep should we drain? From three to four feet in order that the roots of

these crops may have full opportunity to penetrate the soil. It may be suggested that two feet would be sufficient for the early needs of the crop, and that as the season advanced the water would naturally recede farther below, thus giving the roots plenty of space. This argument would have some weight but for one fact: the "water-table" in drained land is not level, but curved. If, in a field that is underdrained, one were to dig a series of holes four feet deep every ten feet between two drains, and if after a heavy rain he were to observe the water in the holes for a day or two, he would find that in a very short time no water remained in the hole at either drain, but the one situated midway between the drains would stand full for a long time, and the others would have less and less in them as he approached the drains, thus showing that the water-table is a curved surface, beginning at either drain and rising between. How fast does it rise? That varies with the soil and with the time since rain. In a clay in fairly good condition, when flow in drains begins to lessen, it will be found that the water rises 1 foot in about 25; in loam, 1 foot in 33; in lighter soils the rise will be slower still. The closer the drains are together the less the height of the crest of the water-table above the drains; the farther apart, the higher the crest; hence the closer the drains are together the shallower they may be; the farther they are apart, the deeper they must be. The depth and distance apart must be so chosen that midway between the drains the soil will be drained a foot and a half or two feet within forty-eight hours after rain, for if the roots are submerged longer than this, they begin to suffer. Applying the gradients of 1 foot in 25 for clay and 1 foot in 33 for loam, we arrive at the general conclusion that if drains are from 3 to 3½ feet deep, they should be placed from 50 to 66 feet apart in clay or clay loam, and from 75 to 100 feet apart in lighter soils. But this is only a general conclusion, and judgment must be used in each individual case.

What to Do when an Owner Refuses Outlet for Drainage Water.

In our experience of the past two years, we have found another phase of the subject equally interesting. Most men for whom we have done work have asked at some stage, "What is to be done if one man refuses an outlet for the drainage water from his neighbor's farm? Can he prevent his neighbor from constructing such an outlet? If not, must he bear any portion of the expense, or must the neighbor bear it all?" The following is an outline of what should be done in such cases:

Course of Procedure Under the Ditches and Watercourses Act.

Before any recourse is had to legal procedure, the parties concerned in a drain affecting two or more owners should get together informally and endeavor to agree on some apportionment of the labor and expense of construction and maintenance. When such meeting and agreement are not possible, then legal proceedings become necessary. The first legal step in the adjustment of a dispute about drainage matters is the formal calling of a meeting of all parties interested. This meeting is to be called by him who requires the construction of the drain. He must serve notices in writing upon all concerned, appointing a day, hour and place convenient to the site of the ditch, at which all the owners are to meet and estimate the cost of the ditch, and agree if possible upon the apportionment of the work, and supply of material for construction among the several owners *according to their respective interests therein*, and settle the proportions in which the ditch shall be maintained; the notices shall be served not less than *twelve clear days* before the time named therein for meeting. (R.S.O. 1897, c. 285, s. 8.)

Blank forms for the notices are given in the Act, a copy of which may be had from the clerk of the municipality. Notices may be served personally or by leaving them at the place of the owner or occupant, with a grown-up person residing thereat, and in case of non-residents then upon the agent of the owner, or by registered letter to the owner at the post office nearest to his last known place of residence. (R.S.O. 1897, c. 285, s. 15.)

In case an agreement is arrived at, it shall be reduced to writing, signed by all the owners, and within six days be filed with the clerk of the municipality, when it becomes as binding as the award of an engineer, and may be enforced in like manner (R.S.O., c. 285, s. 13 (1)). But such amicable agreement at this stage will seldom need enforcement, as the parties thereto will, of their own accord, fulfil their parts, and no further proceedings will be necessary.

In case an agreement is not arrived at, either at the meeting or *within five days thereafter*, then the owner requiring the ditch may file with the clerk of the municipality a declaration of ownership of his land and also a requisition naming all the parcels of land to be affected by the ditch and the respective owners thereof, and requesting that the engineer appointed by the municipality be asked to appoint a time and place in the locality of the proposed ditch at which he will attend (R.S.O. 1897, c. 285, s. 14), and examine the locality; and if he deems it proper, or if requested by any of the owners, he may examine the owners and their witnesses present, and may administer an oath or affirmation to any witness examined by him (R.S.O. 1897, c. 285, s. 16 (1)). Within thirty days after his attendance the engineer will make his award in writing, apportioning the work and the furnishing of the material among the lands affected and the owners thereof, *according to his estimate of their respective interests in the ditch*, fixing the time for the performance by the respective owners, and apportioning the maintaining of the ditch, so that as far as practicable each owner shall maintain the portion on his own land. (R.S.O. 1897, c. 285, s. 16 (1)). In case the work apportioned to any owner is not completed in the allotted time, the engineer may let the contract for its performance to the lowest bidder, the expense chargeable to the land of the defaulting owner. (R.S.O. 1897, c. 285, s. 28.)

Thus we see that a man is bound to give outlet for the natural drainage water from his neighbor's farm, and, not only so, he is liable for cost of construction and maintenance in proportion to the benefit he may be adjudged by the engineer to derive from the drain. The man who requires the outlet must not forget, however, that he, too, is liable for outlet expense in proportion to his interest in said outlet.

Investigations.

In previous years much time has been given to investigation in soils, evaporation, transpiration and poultry. This year we have limited ourselves to poultry investigations, an account of which will appear in a Bulletin now in the hands of the printer. Owing to our extensive work in drainage, we have had to sacrifice our investigations in soils, evaporation, transpiration and other subjects. There are many important problems awaiting solution, and if the assistance previously suggested is given the department, we shall be able to carry on both the drainage and investigation work.

Respectfully submitted,

WM. H. DAY.

PART V.

THE PROFESSOR OF BOTANY.

To the President of the Ontario Agricultural College:

Sir,—I beg leave to present my second annual report of the work of the Botanical department.

The personnel of our staff has remained unchanged during the year. The services of Messrs. Eastham and Howitt have been steadily marked by efficiency, loyalty, and progressiveness. Mr. Eastham made an extensive acquaintance with our locality's flora during the vacation and worked over the herbarium collections. Mr. Howitt spent his vacation at Cornell University, making special study in grasses and economic plants, specially fitting himself for his work of teaching here.

The work of the department is allotted as follows:

First Year Botany. Fall Term, Prof. McCready.

Second Year Botany. Fall and Winter Terms, Mr. Howitt.

Third Year Botany. Fall Term—Plant Morphology, Mr. Eastham. Winter Term—Plant Physiology, Mr. McCready. Spring Nature Study Work, Messrs. Eastham, Howitt and McCready.

Fourth Year Botany. Fungi and Plant Diseases, Mr. Jarvis. Plant Physiology and Histology, Prof. McCready. Cryptogamic Morphology and Systematic Botany, Mr. Eastham. Grasses, Weeds, Economic Plants, Mr. Howitt.

In exchange for Mr. Jarvis' help in Plant Diseases, I take the Fourth year Vertebrate Zoology.

In addition, Mr. Howitt takes the short course in Weeds with the special winter class and has charge of the Information Bureau during the farmers' excursions in June. In all the work assistance is given to one another in laboratory and field work.

A considerable share of my time and interest has to be given to the consideration of the Nature Study Department, as may be seen by that part of my report. During the year I had charge of spring and summer sessions for the training of teachers in Nature Study. With the beginning of this term, there has been freedom in this branch of the work.

New Equipment.

During the year the department has added to its equipment (1) a series of colored charts imported from Europe from different publishers, for illustrating work in plant morphology; (2) a set of cardboard herbarium trays for the more convenient storing and handling of the plant specimens; (3) a set of boxes made on a unit system for the convenient storage of departmental supplies; (4) an assortment of the most important American and British texts in Botany for use as laboratory references, including a set of bound copies of the Experimental Station Record; (5) an assortment of general supplies for class use, comprising, brushes, sectioning razors, labels, dissecting needles, scalpels, glass slides, etc. (6) Besides the above it is expected that we may be able to find accommodation for practical work in Plant Physiology in the greenhouses recently erected for the Entomological department.

While the time and efforts of this department are chiefly spent in the direction of teaching, there is considerable correspondence relating to weeds and fungous diseases. Not infrequently this entails considerable investigation. This correspondence for 1907 has been summarized by Mr. Howitt and is included herewith. The report on the herbarium has been made by Mr. Eastham.

Correspondence.

Several hundred letters have been received during the past year enquiring for information regarding weeds, weed-seeds and fungus diseases. These have been answered and a large number of plants identified. Numerous samples of clover, grass and other economic seeds, submitted to the Department for examination, have also been inspected and reported upon as to purity, etc.

Troublesome Weeds of the Year.

Judging from an analysis of the enquiries received during the past year the following weeds have been the most troublesome:

Perennial Sow Thistle (*Sonchus arvensis*). This pernicious pest seems to be rapidly spreading over the entire Province of Ontario, and in some localities appears to have got almost beyond control of the farmers. This is largely due to the fact that it spreads rapidly both by running underground root-stocks and by seed, which is carried long distances by the wind. Thus, though many farmers are constantly fighting it by means of smother crops, summer fallow, etc., they seem to make but little headway against it as their fields are being constantly re-seeded from the patches on the roadside or in careless neighbors' fields. Combined effort on the part of all the farmers in a district is absolutely essential for the eradication of this pest, as one or two neglected farms will contaminate a whole district.

Bladder Campion or Cow Bell (*Silene inflata*). This is another weed which is gaining ground in Ontario, probably due to the fact that the seeds are often found in clover and timothy seed. It is a deep-rooted perennial and very hard to eradicate. Careful watch should be kept on all timothy and clover seed sown to prevent the introduction of this weed on to the farm.

Field Mustard or Charlock (*Brassica sinapistrum*). This is probably the best known of all our bad weeds, and every year numerous letters are received by the department concerning it. Though the past year has been no exception to the rule it does not seem to be spreading to any great extent except upon neglected farms.

Couch Grass or Twitch Grass (*Agropyron repens*). This is another bad weed about which many complaints have been received, but which does not seem to be gaining ground on well cultivated land.

Field Bindweed (*Convolvulus arvensis*). Though this weed is not spreading rapidly, correspondents report that wherever it is established it is almost impossible to eradicate it.

Stinkweed or Penny Grass (*Thlaspi arvense*). This is a weed which is gradually being spread over the Province of Ontario and which farmers should be on the look-out for as it is a very free seeder and the seeds retain their vitality for a long time.

New Weeds.

During the past year several plants have appeared in Ontario growing as weeds in farm crops which up to the present time have not been reported as troublesome.

One of these is the Field Peppergrass or Cow Cress (*Lepidium campestre*). This is a weed belonging to the Mustard Family introduced from Europe and up to the present time rare in Canada, occurring only in a few localities. This past season, however, specimens of it have been received

Field Peppergrass or Cow Cress (*Lepidium campestre*).

by the department from various parts of the Province, and it now appears to be quite widely spread. It is an annual or biennial from 1-2 feet high, freely branching above. The lower leaves are oblong and entire. Those of the stem are spear-shaped, entire or slightly toothed, and clasping the

stem by their arrow-shaped bases. The seed pods are broadly ovate boat shaped, being rounded below and hollowed out above. They stand out stiffly from the stem on pedicels of about their own length. The seeds are reddish brown in color, about one-twelfth of an inch long, sharply egg-shaped, rounded or somewhat flattened, and the surface is granular and slightly scurfy.

Yellow Rocket or Cress (*Barbarea vulgaris*).

Yellow Rocket (*Barbarea vulgaris*). This is another weed which has been reported as abundant in several localities in Ontario during the past year.

From the enquiries which we were able to make, it appears to have been spread as an impurity in clover seed. In many instances correspondents have mistaken it for Field Mustard or Charlock. It belongs to the Mustard family, but if observed at all closely it is easily seen to be very different from Charlock, which it resembles only in the color of the flower. It is not nearly so rough and coarse a plant. The l aves are smooth and shiny and dark green in color, somewhat oval in shape. The lower are petioled and much divided, the terminal division being much larger than the lateral ones. The upper leaves are sessile and slightly clasping. The seeds are somewhat flattened, and more or less oblong in form. They are light brown in color with a dull and roughened surface. This is an annual plant and should not be difficult to eradicate. It occurs very commonly in New York State, where it is not considered a serious pest.

Smaller Cat's Foot (*Antennaria neodioica*). Several complaints have been received that this plant was proving a pest in permanent pastures by spreading rapidly and crowding out the grass. It resembles somewhat the common everlasting flower (*Anaphalis margaritacea*), but is a much lower growing plant and flowers much earlier in the season. It is a perennial weed and grows in patches, spreading by runners and offsets. As a usual thing it is not troublesome except in dry seasons, when it seems to get ahead of the grass and choke it out. The exceedingly dry weather in some parts of the Province this past season is probably accountable for the fact that it was reported troublesome in several localities. It is not thought that in a normal season it will prove troublesome.

Narrow-leaved Sheep's Fescue (*Festuca tenuifolia*), Sun Spurge (*Euphorbia Helioscopia*), and Cow Cockle (*Saponaria vacaria*) are other weeds which have been reported as troublesome this season for the first time in Ontario, but not to the same extent as those described above.

Recent Introductions.

Eruca sativa. This is a weed which has appeared in Ontario for the first time this year, and which is likely to become very troublesome.

*It was first reported by Mr. J. Dearness, of London, Ont., who received it from a farmer in Elgin County. It had come to him and to a neighbor of his as an impurity in alfalfa seed. This fall this weed was brought to the department for identification by Mr. Groh, a fourth year student, who found it growing freely in an alfalfa field on his father's farm near Preston, Ontario. *Eruca sativa* belongs to the Mustard family, and at a little distance would easily be mistaken for Wild Mustard or Charlock which it resembles closely in size, habit of growth, foliage, and flowers. It requires, however,

Ragwort, Tansy Ragwort or Staggerwort (*Senecio Jacobaea*, L.)

*Ottawa Naturalist, October, 1907.

only a glance to distinguish it. The leaves are more or less deeply pinnately lobed. The flowers are a light yellow, and the petals are distinctly veined with purple. When pods are present the plant can be known with certainty; for the upper third of these is a flat empty beak.

Common Ragwort, Tansy Ragwort or Staggerwort (*Senecio Jacobaea*). This plant has been sent to the Department on two or three occasions from the neighbourhood of Guelph. It has probably been reported before as occuring in Ontario since it is mentioned in the official list of the Toronto Educational Department Herbarium, but as it is not recorded, to our knowledge, in any other list, it is for all practical purposes a plant new to the Province.

This is the weed which has caused so much trouble in the Eastern Provinces. It is a very dangerous weed because when eaten by cattle it causes a curious and fatal disease of the liver (Hepatica cirrhosa). For this reason farmers should keep a sharp lookout for it, and destroy it wherever it appears. It is easily recognized, being a large, conspicuous, strong growing plant, about two or three feet high. The flowers are in numerous heads in corymbose clusters, bright yellow in color and very showy. The root leaves are six to eight inches long, petioled. Stem leaves sessile and clasping, all leaves dark green, deeply twice pinnatified, the segments crowded and overlapping, crisped and waved. This being a short-lived, shallow-rooted perennial, it is not difficult to eradicate; all that is necessary being to cut it in time to prevent it from seeding for several successive years.

Stinking Goosefoot (*Chenopodium Vulvaria*, L.) This plant is a native of Europe where it is found growing by roadsides and in waste places. It is mentioned in the list of plants of the Herbarium of the Toronto Educational Department as of reputed occurrence in Ontario, but no specimen had been collected. It may be regarded as a new introduction since it receives no recognition in the American floras. In duration it is an annual and in habit much resembles the common Lamb's Quarters (*Chenopodium album.*) It is, however, smaller, more diffuse and the leaves are quite entire. The character which leads most readily to its recognition is its foetid odour, which resembles decomposing fish and renders its presence highly objectionable. So far it has been found only in one locality, but here it was found growing in some quantity.

Importation of Weed Seeds from the Western Provinces.

During the year considerable attention has been drawn to the question of seed impurity in western grain. As these impurities are offered for sale for rough feed, a danger of wide infection arises throughout the province. In order to have some definite information available on the subject, samples of screenings were obtained from representative districts through the west and from Ontario millers who ship in western grain. The work of analyzing the samples has been carried on as thesis work by Mr. Gilmore, a fourth year student. In each case twenty grams of the screenings were used. It will be seen that the alarm sounded in the matter is justified, as the seeds are almost invariably those of noxious weeds.

No. of Weed Seeds in each Sample of 20 grams.

No. of sample	Source of Sample	Bindweed.	Hare's Ear Mustard.	Lamb's Quarters.	Wild Oat.	Pig Weed (Red Root).	False Flax.	Wild Sunflower.
1	Elevator, MacLaughlin & Ellis, Indian Head	280	113	886	27	167	13	7
2	Elevator, Glen, Indian Head	346	15	1667	2	157	....	1
3	Flour-mill, Wilson, Indian Head	556	27	302	4	74	1	259
4	Sherwood District, south of Regina	127	120	13	7	....	....	....
5	W. H. Graham, Pettapiece, north of Brandon	320	27	8507	13	2304	7	7
6	Elevator screenings, Moosejaw	625	75	425	...	450	....	25
7	Elevator screenings, Brandon	160	....	807	460	780	33	13
8	Manitoba screenings, Goldie Company, Ayr, Ont.	907	....	40	113	227	....	7
9	Manitoba screenings, Goldie Company, Galt, Ont.	932	20	273	107	1346	14	....
10	N. W. Screenings, Wolverton Company, Wolverton, Ont.	93	5	....	20	81	110	2
11	Elevator, Moosejaw	17	66	317	....	433	....	....
12	" "	51	....	589	....	384	....	....
13	" Dauphin, Man	37	....	273	390	242	26	....
14	" Giroux, "	411	....	2758	253	2274	63	....
15	" Portage La Prairie	881	....	2219	150	1608	19	....
16	G. Carter, Son & Co., St., Marys	1644	77	1450	67	1288	39	33
17	Goldie Co., Ayr	729	125	854	....	5614	83	31
18	Lake of Woods Milling Co., Portage La Prairie	1227	205	605	261	433	33	....
19	Man. screenings, Goldie, Guelph	620	6	20	47	87	6	....

No. of sample	Stickseed.	Penny Cress.	Tumbling Mustard.	Chess.	Cow Cockle.	White Cockle.	Great Ragweed.	Perennial Sow Thistle.	Wormseed Mustard.	Corn Cockle.	Canada Thistle.	Ergot.	Russian Pigweed.	Charlock.
1	20	13	7	.....	.....	.....	.....	.....	.....	.....	.....	....	.....	.....
2	2	1	.....	.....	.....	1	.....	.....	.....	.....	.....	....	.....	.....
3	45	5	5	64	3	.....	.....	.....	.....	.....	.....	3	2	.....
4	20	47	.....	27	.....	.....	.....	.....	.....	.....	.....	....	.....	.....
5	....	.....	20	.....	20	47	.....	.....	.....	.....	7	....	.....	.....
6	....	.....	.....	.....	.....	.....	.....	.....	52675	.....	.....	....	.....	.....
7	40	.....	.....	.....	.....	33	13	.....	.....	.....	.....	....	7	.....
8	....	.....	27	.....	.....	.....	11	6	.....	.....	.....	....	.....	.....
9	6	.....	66	.....	.....	13	.....	.....	.....	2	.....	....	6	39
10	3	3	.....	1065	.....	1	.....	.....	.....	9	.....	....	.....	.....
11	....	34	.....	.....	.....	.....	.....	.....	66834	.....	.....	....	.....	.....
12	....	.....	.....	.....	.....	.....	.....	.....	69872	.....	.....	....	.....	.....
13	....	11	47	.....	.....	.....	.....	.....	5	1	.....	....	.....	.....
14	....	68	27	.....	79	37	84	26	263	.....	.....	....	.....	.....
15	....	31	.....	.....	....	25	.....	.....	12	.....	.....	....	.....	.....
16	33	34	55	.....	27	.....	.....	.....	33	22	.....	....	.....	.....
17	31	229	10	10	250	135	.....	.....	83	9	.....	....	.....	.....
18	....	27	72	.....	128	16	39	.....	.....	11	.....	....	.....	.....
19	...	13	6	.....	27	.....	.....	.....	.....	3	.....	....	.....	.....

Injurious Fungous Diseases of the Year 1907.

Very few attacks of fungous disease have occurred in the Province during the past year, only three or four diseases having been reported as doing any serious harm.

Crown Gall (*Dendrophagus globosus*). This disease was very prevalent in the fruit growing sections of the Province during the past year, many peach trees and raspberry canes having been destroyed by it. It is by no means a new disease, as it has caused considerable loss in past years. The plants attacked by this disease show galls of soft, spongy, or corky tissue on the crowns of the root system or sometimes on the roots and stem. In the early stages these knots are the same color as the roots, but as they mature they become darker in color and rough and warty. They vary in size from that of a pigeon's egg to bunches as large as one's fist. Towards the end of the season these galls decay and fall away, and are followed by new galls the succeeding year on other portions of the roots. The plants affected with the disease become spindly, stunted, and sickly and soon die. The cause of the disease is an organism found in the tissue of the galls, belonging to the Myxomycetes or slime moulds. It is spread chiefly through the agency of infested nursery stock though there is evidence to show that it may spread through the soil for limited distances.

Treatment. The nature of the disease is such that no treatment can be applied, hence prevention is the only source of relief. Affected trees should be dug out and burnt and nursery stock carefully inspected before planting and all diseased trees rejected.

Pear Leaf Scald (*Entomosporium maculatum*) on Quince leaf.

Pear Leaf Scald (*Entomosporium maculatum*). Leaves affected with this disease were sent to the department by several fruit growers in the Niagara district, who reported that the foliage of their pear trees was badly

damaged by the disease. Leaf Scald is very common wherever pear trees are grown and in some seasons causes considerable damage. The first indication of this disease is the appearance of red spots on the upper surface of the leaves; these increase in size and number and become brown with one or more black dots towards the centre. The injured leaves usually become yellow and brown and fall from the trees. Thus in severe attacks the trees are defoliated, the growth stopped, and the fruit severely injured. Generally a second growth of leaves takes place, but these are too late to properly mature the wood and hence the trees are very likely to suffer from winter killing.

Remedies: The results of carefully conducted experiments indicate that Bordeaux mixture properly applied will hold this disease completely in check.

Alternaria Blight of Ginseng. Ginseng is a crop which is not grown to any extent in Ontario, though a few men are growing it as a special crop. During the past season complaints were received that the ginseng plants were being destroyed by a blight. Careful examination of the leaves affected revealed the fact that the cause of the trouble was a parasitic fungus in the tissues of the plant. This fungus proved to be Alternaria (species not yet determined). The blight caused by this organism is generally known as the Alternaria Blight of Ginseng. This disease is difficult to describe as it manifests itself in various ways, depending upon the part of the plant attacked. Spotting of the foliage is generally the first indication.* If examined early in the morning the diseased spots are of a dark green color and watery as if scalded. They dry rapidly, becoming papery and of a light brown color, definite in outline and very brittle. The disease progresses rapidly, especially in damp weather, so that in a few days the whole leaf wilts and hangs limp from the stalk. All parts of the top are affected though the disease never reaches the roots, affecting them only indirectly.

Remedy: Thorough spraying with Bordeaux mixture begun when the plants first come through the ground and repeated at frequent intervals will control the disease.

Blighting of Oats. In addition to the above there was a rather widespread physiological blight reported during the summer. The trouble was mostly in oat fields and specimens showed the upper parts of the plants as yellowing and dying. Investigation failed to disclose any causative fungi present. The trouble was very probably due to unfavorable weather conditions, the root system having been impaired by a continued cold spell following an earlier warm season, the plants were unable to get proper nourishment and water supply from the ground.

The Herbarium.

During the past year the entire contents of the Herbarium have been overhauled. This work has entailed much labor, the results of which are not perhaps of a very conspicious kind. An extensive herbarium, however, with the specimens reliable in their naming and easily accessible is absolutely essential for both reference and teaching purposes in the Botanical department of any college. Much accumulated material has been sorted over, those specimens which were serviceable allocated to their respective places and the rest removed. Every specimen in the collection has been diagnosed afresh from standard floras and specimens of undoubted accuracy, and the whole labelled, numbered, and indexed in accordance with

*Bulletin—Alternaria Blight of Ginseng, by H. H. Whetzel, Assistant Professor of Botany, Cornell University, Ithaca, N.Y.

the Harvard University Herbarium check-list, based upon Gray's Manual. Durable trays have been provided for orders, sub-orders, etc., to save the specimens and to facilitate handling. The number of compartments in the cabinets has been nearly doubled by the insertion of new shelves.

The herbarium is not perhaps very commodious nor conveniently located near our laboratories, but some common annoyances in connection with such collections have not been much in evidence. So far no trouble has been experienced from mite and insect infestation or from mildew, and it has not been necessary to dress the specimens with preservatives.

The total number of species and varieties of North American vascular plants represented in the Herbarium is about 1,400, and many of these are represented by a good series of specimens. Among the more important collections are those of Professor Macoun, Mr. W. C. McCalla (Plants of the Northern Rocky Mountains), the Entomological Society of Ontario, Halsted ("American Weeds"), as well as those made by various members of the staff. The most serious defect is the absence of any adequate collection of Western plants. As a number of the students,, however, come from the West, the nucleus of such a collection is being formed from the specimens submitted by such students as a portion of their practical work.

In addition to the above, the department also possesses some hundreds of Japanese specimens named by a reliable authority, and two fairly extensive collections of British plants. It may be urged that these are of little importance in this institution, but this is not the case. With the extension of commercial relations, new plants are continually being imported into this country to spring up sporadically at first, and if adapted to local conditions and left unmolested, to become established, perhaps as troublesome weeds. As examples of this introduction, we may mention the Asiatic plant, Hare's Ear Mustard (*Conringia orientalis*) now such a pernicious weed in the West, and the occasional occurrence of Indian Mustard (*Brassica juncea*) in our own neighborhood. This summer, too, an English plant, the Stinking Goosefoot (*Chenopodium vulvaria*), a weed with very offensive properties, was found growing in some abundance in a garden in Guelph. This plant is not recorded in our floras, and its identification would have been impossible without recourse to British floras or herbaria.

In the course of the ensuing year a valuable addition will be made to the section of non-vascular cryptogams in the shape of a representative collection of Lichens and Bryophytes prepared by Professor Macoun. The identification of these plants presents peculiar difficulties without authenticated specimens for comparison. They are not perhaps of economic importance, but they form the bulk of the herbaceous vegetation to be found during the spring course of Nature Study, and for this reason the collection alluded to will be a great help.

For the purpose of encouraging students to identify their own specimens by the judicious use of floras and type specimens, as well as to save the reference herbarium, two small collections have been prepared and placed so as to be of access to students. The one includes such wild plants as are of common local occurrence and the other those cultivated varieties which are grown either in houses or gardens for the sake of flowers or foliage.

In conclusion a list of some of the new plants acquired during the past year is appended:—

NEW PLANTS ADDED TO HERBARIUM IN 1907.

Eruca sativa, Mill. Preston, Ont.
Delphinium ajacis, L. (Small Larkspur). Aberfoyle, Ont.
Conringia orientalis, Dumort (Hare's Ear Mustard). Saskatchewan.
Physaria didymocarpa, Gray (Bladder Pod). Saskatchewan.
Chenopodium vulvaria, L. (Stinking Goosefoot). Guelph, Ont.
Astragalus Missouriensis, Nutt. (Missouri Milk Vetch). Saskatchewan.
Astragalus triphylles, Pursh. (Sessile-flowered Milk Vetch). Saskatchewan.
Oxytropis Lamberti, Pursh. (Stemless Crazy Weed). Saskatchewan.
Oxytropis splendens, Dony. (Showy Oxytropis). Saskatchewan.
Pentstemon gracilis, Nutt.. (Slender Beard-tongue). Saskatchewan.
Pentstemon cæruleo-purpurea, Gray. (Purple Beard-tongue). Saskatchewan.
Pentstemon cristatus, Nutt. (Crested Beard-tongue). Saskatchewan.
Mulgedium leucophæum, D.C. (Tall Blue Lettuce). Saskatchewan.
Psoralea argophylla, Pursh. (Silver-leafed Psoralea). Saskatchewan.
Glycorrhiza lepidota, Nutt. (Wild Licorice). Saskatchewan.
Erigeron cæspitosus, Nutt. (Tufted Fleabane). Saskatchewan.
Peucedanum villosum, Nutt. (Hairy Parsley). Saskatchewan.
Pholx Hoodii, Richards. (Hood's Phlox). Saskatchewan.
Helianthus petiolaris, Nutt. (Prairie Sunflower). Saskatchewan.
Viola Nuttallii, Pursh. (Nuttall's Violet). Saskatchewan.
Spartina gracilis, Trin. (Inland Cord-grass). Saskatchewan.
Spartina maritime, Scrib. (Smooth Marsh-grass). Nova Scotia.
Allium reticulatum, Fraser (Fraser's Wild Onion). Saskatchewan.
Bouteloua oligostachya, Torr. (Buffalo Grass, Mesquite Grass). Manitoba.

Respectfully submitted,

S. B. McCREADY.

PART VI.

THE PROFESSOR OF ENTOMOLOGY AND ZOOLOGY.

To the President of the Ontario Agricultural College.

Sir,—I have the honor to present my second report on the work of the department of Entomology and Zoology during the year. My colleague, Mr. Tennyson D. Jarvis, and I have carried out the course of lectures and laboratory instructions prescribed in the College Calendar. In addition to these specified duties, a considerable share of our time is taken up with answering enquiries, which come to us from all parts of the country, respecting noxious and other insects, naming specimens, collecting material for laboratory use, etc. The department is regarded by farmers and fruit-growers as a bureau of information on all matters connected with the attacks of insects and fungus diseases that affect plants of all kinds, and fruits and crops; our correspondence is, therefore, an important part of our work, and, judging from many letters received, is much appreciated.

Course of Instruction.

In last year's report (1906) a detailed account was given of the course of instruction in the departments of Entomology and Zoology. As no changes have been made in this course, it is unnecessary to repeat the subjects of study and the time devoted to them by each of the student years. The object aimed at is to give those taking the short course of two years at the College instruction in elementary Zoology and a fair knowledge of economic Entomology; and to the students completing the full course of four years a systematic knowledge of Entomology and general Zoology and to make them familiar by study of specimens both out of doors and in the laboratory with the common insects that are injurious and beneficial, and with our native birds and animals of various kinds. In the final year the specialists in Biology and Horticulture receive individual attention and are directed in a scientific study of various orders of insects and microscopical work.

During the month of June a series of lectures was given to the Nature Study class of teachers from the Eastern Provinces, and in July to the Summer School of Ontario teachers.

A series of lectures was also given to the Senior Normal Class of the Macdonald Institute on the structure and physiology of plants and animals; this course extended throughout the College year.

In connection with the course of instruction some useful scientific work is being carried on by students who have taken up Entomology as the subject of the theses they are required to present at the close of the fourth and second years. Mr. H. A. Wolverton (4th year) is studying Insects and Fungus Diseases attacking wild plants belonging to the order Rosaceæ. Mr. H. Groh (4th year) is conducting a series of careful experiments in greenhouse fumigation against the White-fly and other insects. Mr. L. Caesar (4th year) is making a study of the Lime-sulphur treatment for Scale insects. Mr. R. C. Treherne (3rd year) is studying the Parasitism of Galls, including inquilines and the natural checks of the increase of Gall flies. Mr. W. R. Thompson (3rd year) has taken up the study of the Analgesidæ, or Bird Mites; Mr. A. J. Logsdail (3rd year) the Insect and Fungus parasites of Scale insects in Ontario; Mr. C. H. H. Ward (2nd year) a

study of the Siphonaptera in Ontario; Mr. E. W. Stafford (3rd year) the genus Pseudococcus in Ontario, and Mr. R. Fraser (2nd year) the Cynipidous Gall-flies.

Correspondence.

The number of enquiries respecting a great variety of injurious insects has largely increased, being more than double the number received during the corresponding period of last year. These have all been carefully considered and fully replied to; in some cases the questions concerned unfamiliar and obscure forms, and it became necessary to devote to them a good deal of time and research. The daily attendance of a stenographer has been of great assistance in facilitating this branch of our work.

The following are some of the more important insects about which enquiries were made, owing to their ravages and abundance: Scale Insects have attracted more attention this year than ever, and specimens of a variety of species have been sent in for identification. The Oyster-shell Bark-louse (*Lepidosaphes ulmi*) has been a constant subject of enquiry from one end of the Province to the other. Owing to neglect in the past, it is a widespread and serious injury to apple and other trees, and should receive careful attention by every fruit-grower. The lime wash applied after the leaves fall in late autumn is a most effective remedy if properly done.

The San Jose Scale (*Aspidiotus perniciosus*) is gradually spreading from its centres of infestation in the Niagara fruit district and the counties of Essex and Kent owing to the carelessness and indifference of some fruit-growers. Specimens were this year received from Aylmer in the county of Elgin. There is no doubt that it can be kept in control by the use of the lime-sulphur wash, if it is properly made and thoroughly applied.

In addition to these two familiar scales, we have received samples of the Scurfy Bark-louse (*Chionaspis furfurus*), the Forbes and Putnam's scales attacking fruit-trees, *Diaspis rosæ* on blackberry, the Terrapin (*Eulecanium nigrofasciatum*) and the *Pseudococcus aceris* on Maples. The Cottony Maple-scale (*Pulvinaria innumerabilis*) has ceased to be abundant and in all probability will not be a serious pest for some years to come.

Many complaints have been made of the ravages of Wireworms and White grubs, the larvæ of Click-beetles (*Elater*) and May-beetles (*Lachnosterna*) respectively. For these underground root-feeders it is most difficult to find any effective remedy; the only satisfactory method of dealing with them is to break up their breeding places in old pastures and carry out a proper system of rotation of crops. This applies also to the Rose-beetle (*Macrodactylus subspinosus*) which in its adult stage is so injurious to the blossoms of grape vines and to many flowering shrubs and plants. It was reported from several new localities this year, but on the whole does not seem to have been as abundant as usual.

Several species of Plant-lice (*Aphis*) have been excessively abundant this year. The so-called "Green Bug," which received wide-spread notice in the newspapers throughout the States to the south and west of us, and was regarded with no little consternation, was reported to us from only one locality in Ontario, a wheat field near Toronto. Our common grain aphis, which attacks the ears of the wheat, was somewhat abundant in several places through the southern districts of the Province. But the most serious and widespread attack was made by the well-known species which is found late in summer and during the autumn in enormous numbers on turnips and cabbages. It seemed to have been everywhere prevalent this year and to have inflicted a great deal of damage upon these two crops.

Among insects affecting fruits may be mentioned the Grape-vine Flea-beetle, the Plum Curculio, Pear-tree slug, Eye-spotted Bud-moth, Raspberry borer and girdler, Tree-crickets and the Shot-hole Borer (*Scolytus*), which were all prevalent during the past season.

Mention may also be made of the Raspberry Root-gall, the result of a fungus disease, which appeared in a number of places and inflicted considerable damage.

Garden crops were attacked by the Tarnished and Four-lined bugs, the Striped Cucumber-beetle, Cut-worms, Red Spider, Cabbage and Onion Root-maggots, Strawberry Weevil, Asparagus beetles, etc., but these are our annual enemies against which we must always expect to wage war.

Amongst other insect attacks may be mentioned the Spruce Gall-mite which is a wide-spread injury to these favorite ornamental trees; the Bronze Birch-borer; the Pigeon Tremex and the Flat- and Round-headed borers (*Dicerca divaricata* and *Plagionotus speciosus*) which are injuring Maple trees in the streets of Guelph, Woodstock and other places; and the Buffalo beetle which causes so much dismay to the careful housekeeper. From three different places has come a complaint of a curious invasion of houses by myriads of a minute mite (*Bryobia pratensis*) which usually feeds upon clover and foliage; these tiny creatures seem to have come indoors to seek shelter and obtain comfortable winter quarters; though they would not be likely to injure anything in the house, their presence in multitudes was extremely unwelcome. Another singular trouble was the presence of a malodorous beetle (*Nomius pygmæus*) which in one case made itself known by an insufferable odour that penetrated the whole dwelling and drove out the legitimate inmates. Hapily this is a very uncommon visitant.

There remains to be recorded a most unusual and remarkable outbreak of Cutworms which deserves a fuller description.

Remarkable Outbreak of Cutworms.

In July much alarm was created in the neighborhood of Leamington, Ontario, by an extraordinary outbreak of caterpillars which devoured everything before them. Application was made to the President of the College for advice and assistance, who referred the matter to the Entomological department; Mr. L. Caesar and Mr. McMeans were at once sent up to investigate. The latter brought back specimens the following day, and the insect proved to be the Variegated Cutworm (*Peridroma saucia*), which has on previous occasions appeared in devastating numbers, the most serious outbreak having occurred in British Columbia and the neighboring Pacific coast States in 1900. Near Leamington the worms were first discovered in clover fields where they soon devoured the crop and left the ground bare and black; they then marched on to the next field and consumed whatever vegetation they met with, corn and tobacco, tomatoes and other vegetables, seemed especial favorites for consumption. If a fruit-tree happened to be in their way, they climbed it, and devoured both fruit and foliage; many peach trees were thus attacked and the fruit ruined.

Like other cutworms these caterpillars feed only at night and remain in concealment during the day, hiding in the ground where the soil is loose and under any rubbish or other shelter that they can find. When full-grown the worm is about two inches long, with a yellowish stripe on each side above the legs, the rest of the body is darker and mottled with black, white or grey; the most characteristic feature is a row of yellow or white spots,

five to seven in number, along the middle line of the back. Some were already changing into the chrysalis stage, for which purpose they bury themselves in the ground and form there an oval earthen cell. The moth, into which they finally turn, has a wing expansion of about an inch, and is dark blackish brown in color, often clouded with red towards the front margin of the wings, but with no conspicuous or distinguishing markings; the underwings are white with a pearly lustre. Like so many other of our most destructive insects, this one has come to us from Europe.

Mr. Caesar was able to allay the alarm caused by this strange outbreak by suggesting simple and effective remedies. Where the caterpillars were migrating from one field to another their progress was checked by ploughing a deep furrow across their line of march and boring a post-hole in it at short intervals; the worms fell into the furrow and being unable to climb up the steep friable side they moved on until hey dropped into the post-holes. In these large numbers were found in the morning and easily destroyed. Where the worms were already in a field or garden, they were checked by the use of the poisoned mash made of half a pound of Paris green mixed with 50 lbs. of flour which had been sweetened with molasses; bran is usually employed but could not be obtained. The cutworms eat this mixture in preference to the vegetation, and perish in large numbers. Full particulars for making the mash and directions regarding other methods were printed in leaflet form and widely distributed in that part of the country. Subsequently a Press Bulletin was prepared, and sent to all the country newspapers in Ontario west of Toronto, and to many of the city dailies; it was satisfactory to find that it was printed in the majority of instances, and thus the best methods of dealing with the outbreak were made known far and wide.

We have been gratified to learn that the farmers in the district about Leamington expressed themselves as deeply thankful for the prompt assistance that they had received from this department of the College.

During the next few weeks complaints come in from all parts of Ontario, west of Toronto, regarding ravages of these cutworms. Green tomatoes were bored through and through; choice flowers, such as gladioli, tuberous begonias, etc., which are usually free from insect attack, were in many places almost destroyed, while garden vegetables and field crops were seriously injured. To most correspondents the attack was a mysterious one; as the worms feed at night and hide away in the day time, the depredator was not to be seen and they did not know what caused the destruction they deplored.

Spraying to Kill Mustard.

On June 28th, Mr. Jarvis was invited to visit the farm at Woodstock in connection with the Hospital for Epileptics, where he found a large field of oats overrun with mustard. The oats were about six inches high and the mustard was in full bloom. Careful directions were given when and how to spray and where to purchase bluestone and the necessary sprayer. The results following the treatment were highly satisfactory.

A Visit to Professor Goldwin Smith's Garden.

On July 15th, Mr. Jarvis visited the gardens of Prof. Goldwin Smith, Toronto, for the purpose of determining the insects attacking his vegetable crops respecting which he had written for information. He found

Aphids and a few other insects on the beets and cabbages and recommended spraying with kerosene emulsion for the aphids. The directions he gave were carefully carried out and the results were very satisfactory.

Publications.

In addition to editing the "Canadian Entomologist" and the Annual Report to the Legislature of the Entomological Society of Ontario, I have prepared the following articles for publication:

O. A. College Bulletin No. 158, "Insects Affecting Fruit Trees." A second edition of this Bulletin has been also prepared and sent to the Department of Agriculture for publication; it has been much enlarged by the incorporation of "Fungus Diseases of Plants" by Mr. T. D. Jarvis.

"Injurious Insects of 1907 in Ontario," Annual Report of the Entomological Society of Ontario.

"Remarkable Outbreak of Cutworms," the Press Bulletin already referred to.

A series of short articles in the Farmer's Advocate replying to enquiries respecting a number of insects. Articles of a similar character in the Farming World, the Canadian Horticulturist, the Toronto News, London Advertiser, and the Toronto Weekly Sun.

Mr. Jarvis has made the following contributions during the year:

"Fungus Diseases affecting Fruit-trees" forming part of the new edition of the Bulletin on Insects affecting Fruit-trees.

"Some Additional Insect Galls of Ontario," and,

"The Scale Insects of Ontario," Annual Report of the Entomological Society of Ontario.

"Nature Study Work at the Guelph Central Exhibition" published in the Guelph Herald and Mercury, the Farmer's Advocate, and some other newspapers.

He has also edited the "Ontario Natural Science Bulletin; the Journal of the Wellington Field Naturalists' Club" for 1907.

Field Experiments.

A number of field experiments were made by Mr. L. Caesar, with lime-sulphur, in order to discover more about its efficiency as an insecticide and fungicide, and the best way to make it. Over 550 gallons of the mixture were put on trees of different kinds at different dates. The following is a brief summary of the most important results so far obtained:—

(1) To bring about the necessary chemical combination of the lime and sulphur most rapidly, the mixture should be boiled in about 13 gallons of water. If the boiling is vigorous 45—60 minutes will be sufficient time.

(2) The color obtained at the end of this time depends almost entirely upon the kind of lime used; for instance, Port Colborne lime gives a dirty dark green, Guelph a greenish yellow, or an orange yellow with a green shade in it.

(3) The wash should be kept well stirred when being put on the trees because actual tests showed that the red supernatant liquid was not quite so effective as the denser liquid beneath. There was a difference of several per cent. in favor of the latter and of the well mixed liquid.

(4) Late spring spraying was doubly as effective for Oyster-shell scale, at least, as early spring spraying. The spray should be put on just before, or better when, the buds are bursting. Very little injury is done to apples, pears or plum trees even when the buds are almost fully opened.

(5) A rain shower coming immediately after the spraying, before the wash has time to dry, renders it useless, but if the wash has once dried it will stand a rain very soon afterwards. Spray should not be put on when the trees are wet.

(6) Oyster-shell scales were very little injured by early spraying but a large proportion of them were killed by the late spraying, that is, at the time when the buds were half-opened. Flour-kerosene or kerosene emulsion applied just after the eggs have hatched gave rather better results than lime-sulphur. On the whole, however, the results of late spraying against the Oyster-shell scale were fairly satisfactory.

(7) The New York Plum scale (*Eulecanium cerasifex*) was killed wherever the spray covered it. Very careful spraying of the underside of the branches is necessary to kill all these insects.

(8) About 50 per cent. of the aphids which had hatched out a few days before the spraying was done were killed. The rest escaped the spray by being concealed among the tiny leaflets in the opening bud. Further experiments have just been performed to test more accurately whether the spray kills the eggs of aphids. It is too soon yet, however, to determine the results. A great deal of difference of opinion exists among fruit-growers on this point.

(9) Bud moths were quite uninjured so far as could be determined.

(10) It was impossible to determine the effect upon fungus diseases because Bordeaux mixture was used later in the season on the same trees.

(11) The formula recommended is still 20 lime, 15 sulphur, 40 water, or 22, 18, and 40. The latter is slightly superior but somewhat more costly.

(12) The lime that was the most satisfactory to spray with because of its tendency not to settle to the bottom so rapidly as others was that procured from Port Colborne. However, the other kinds of lime used gave good results, but somewhat more care had to be taken to see that these were kept well stirred.

Experiments with (a) Air-Slaked Lime; (b) Road Dust to Destroy Asparagus Beetles.

Ordinary air-slaked lime was dusted carefully over the grubs of the beetles but the effect was very unsatisfactory. Road dust used in the same way also gave a poor result.

Experiment with Arsenite of Lead to Destroy Asparagus Beetles.

A sample of Arsenite of Lead sent us by the Sherwin-Williams' Co., was used on the Asparagus beetles in August. The result was quite satisfactory. Practically all the adults and larvæ were killed. The eggs of course were not injured so that the dose had to be repeated some days later.

Bandaging for Codling Worms.

The Codling worm here has been well controlled in the orchard by spraying with poisoned Bordeaux. A few trees, however, on the campus were left unsprayed. Bandages were put around two of these and removed at least once every ten days. Between July 20th and September 28th, 295 Colding worms were captured in this way. Of these 5 per cent. emerged, showing that we had here this year at least 5 per cent. of a second brood.

Experiments with Kerosene Emulsion to Destroy the Oyster-shell Scale.

Mr. J. W. Crow reports as follows:—On June 20th two apple trees badly infested with Oyster-shell scale were sprayed with 11 per cent. flour-kerosene emulsion. The young insects had been on the move for several days and many were still running. The mixture was prepared according to the formula recommended by Macoun, viz., 5 pounds flour, 5 gallons kerosene and 40 gallons water. One-half pound flour was placed in the tank of the hand spray-pump. This was scalded with a couple of pints of boiling water and then thoroughly mixed into a paste in order to break up all lumps. One-half gallon of kerosene and two gallons of water were then added and the pump was again placed in position in the tank. The mixture was thoroughly churned by forcing it through the pump and back into the tank, using a Friend nozzle. Agitation was continued for ten minutes. Water was then added to make four and one-half gallons and after a second mixing the preparation was applied to the trees. Very thorough application was made, and the liquid dripped freely from the leaves.

Two other trees were sprayed with soap-kerosene emulsion prepared according to the ordinary formula of kerosene, 2 gallons; water, 1 gallon; soap, ½ pound. One-quarter pound of Sunlight soap was boiled and thoroughly dissolved in ½ gallon water. The whole was added to 1 gallon of kerosene and thoroughly churned in the manner described above. A creamy mixture resulted which spread evenly on clean glass without showing any separation of oil. Sufficient of this stock solution was added to 4 gallons of water to make a 7 per cent. kerosene emulsion. The ease with which this stock solution mixed with and remained in suspension in water was very noticeable. A sample of each emulsion was placed in a small glass vessel. The soap-kerosene showed an even distribution throughout at the end of 24 hours, while an inch of thick, cheesy material gathered at the top of the flour-kerosene in five minutes, leaving the remainder of the vessel practically clear. Neither sample, however, showed any actual separation of oil for at least two days.

The applications were made at mid-day in bright, warm weather. No injury was done to the foliage and at no time during the summer could any considerable number of live insects be discovered. It is estimated that at least 85 per cent. of the scale was destroyed, and the result is looked upon as being highly satisfactory. The actual cost for labor and materials of preparing these mixtures on a commercial scale remains to be determined.

Experiments with Hydrocyanic Acid Gas.

Mr. H. Groh reports as follows:—The appearance of the White-fly (*Aleyrodes vaporariorum*) at the College greenhouses a couple of years ago, and its rapid increase to almost serious proportions as a pest, has caused the question of greenhouse fumigation with HCN (Hydrocyanic acid) gas, to become a live one here. Work against the White-fly at other stations has so generally demonstrated the efficiency of this remedy, that it has come to be regarded as the specific for this particular insect. The results of the first attempts at its use here, however, proved so uncertain, and even contradictory, that the need was felt for a fuller knowledge of the conditions essential to success than was obtainable from the literature on the subject. As a consequence, the experimental work briefly outlined below was undertaken last spring.

Among the points upon which it was sought to secure data are: the effect of temperature, sunlight, moisture, and other influences, on the resisting powers of plants to the gas, and the susceptibility of the White-fly and other insects to the gas; so that from these considerations a strength of the gas might be found which could be relied upon to kill the fly, without being too close to the danger limit for the more tender plants. Observations were also made on the ability of the various greenhouse plants to withstand the effects of HCN gas.

The amount of time which I have been able to give to this work has been altogether incommensurate with the extent of the problems; and, as much of the first work had necessarily to do with questions which had been investigated, to some extent, at least, at other places, the new information gained may seem somewhat meagre. Then, too, where it does not coincide with the results obtained by others, it should be supported by further experiment before being opposed too confidently against those results.

The experimental work done consisted of a series of 37 box fumigations, and 10 of greenhouses. The former was carried out partly as a preliminary to greenhouse fumigation, and partly on account of its convenience for securing known conditions and exact results. A tight box was used which enclosed 16 cubic feet of space, and had two sides of glass through which to observe the insects. In this series of tests the doses used ranged from .0035 g. to 2 g. per cu. ft. of 98 per cent. KCN.; the length of exposure varied from 5 to 60 minutes; and the temperature from 50° F. to 65° F. Work under greenhouse conditions has been mostly so far in all-night exposures to weak strengths of the gas—from $\frac{1}{4}$ to $\frac{3}{4}$ of an ounce of KCN. per thousand cubic feet.

A few of the results and conclusions from these experiments will be briefly enumerated.

Of the common greenhouse pests, the White-fly proved to be by all odds the most susceptible to the gas. Next in the order given were the black aphis, green aphis, ant, mealy bug and red spider; the two latter being rarely, if ever, killed even by the strongest doses. The weakest gas to which the White-fly succumbed was that generated from .007 g. KCN. per cubic foot; and with the strongest gas used, namely .2 g. per cubic foot, it dropped in from one to two minutes. The green aphids and ants usually dropped also, sometime after the White-fly, but in most cases recovered within a few hours after removal from the gas. It is a very interesting fact on the other hand that the aphis is susceptible to tobacco preparations such as "aphis punk," and the White-fly recovers from these just as readily as the aphis does from HCN.

The box experiments seem to indicate a much wider margin (for box conditions at least) than was expected, between what will kill the fly and what will injure the tender plants.

The greenhouse experiments also go to prove that the White-fly can be controlled without the use of large amounts of the gas, which endanger the plants. The gas from a quarter to half an ounce of KCN. to 1,000 cubic feet, left over night, has given uniformly satisfactory results in killing practically all the adults. The nymphs require stronger amounts of the gas. Of the conditions which increases the danger of injury to plants, direct sunlight is undoubtedly the most important. A high temperature is also to be avoided. A dose which gives good results at 55° F. may do much injury to some plants at temperatures above 60° F. Moisture on the plants, or the humidity of the room, has not been proved to have any marked influence.

Plants show a great variation in their powers of resistance to the gas. Among those found most easily injured are the following: Tomato, Pineapple, Salvia, Pilea, Tradescantia (striped one only), scented Geranium, scented Verbena, Ageratum, Salvia. In this connection it is interesting to note that a considerable proportion of the plants which exhale an odour or fragrance when bruised have been found among the most tender plants. It is also a point of some interest that scarcely any two species of plants showed injury in exactly the same way. The majority of them were injured most about the younger parts, but there were exceptions to this.

The Fall Fairs.

During last summer the Ontario Government appointed a graduate from the Ontario Agricultural College to the staff of each of six of our high schools, or Collegiate Institutes, in different parts of the Province. The six men chosen for the purpose spent part of the summer at the College preparing themselves more fully for their work. While here they unanimously requested that the Entomological Department should provide them with an exhibit which could be used at the fall fairs in their respective counties. The object in view was to use the exhibit as a means of attracting the attention of the farmers and thus getting better acquainted with them; and it was also thought that the exhibit would have a valuable educational effect. President Creelman granted the request, and an exhibit, or rather, two exhibits were prepared, because in some cases two fairs had to be attended on the same days.

The following is a brief outline of the composition of each exhibit:

1. Four cases of insects, each case about two feet long by one and one-half feet wide. Though these cases were meant chiefly to make a good background and attract attention, care was taken that as many as possible of our common species of insects were represented in them, so that they could be used as a reference in answering questions. One of these cases contained specimens of most of our native Ontario butterflies, and also of our largest and most attractive moths; another case was composed entirely of moths; and the other cases were representatives of the other orders.

2. Six smaller pasteboard cases of insects. These cases were filled with sheet cotton-batting, on which the insects were placed and a glass cover put on to keep them in position without in any way concealing them. One of these was entitled "Some of Our Most Beneficial Insects" and included such specimens as Honey Bees, Bumble Bees, Ichneumons, Tachina and Syrphus Flies, Ladybird Beetles and their larvae, and Lacewinged Flies. Four of the other cases were headed "Some of Our Injurious Insects" and represented, so far as opportunity permitted, life-histories of the Codling Moth, Tussock Moth, Apple-tree Tent-Caterpillar, Variegated and other kinds of Cutworms, Wireworms, Pea Moth, Pea Weevil, Plum Curculio, June Beetle, both kinds of Asparagus and Cucumber Beetles, Round and Flat-headed Borers, Potato Flea Beetle, Buffalo Carpet Beetle, Red-humped Caterpillar, Buffalo Tree-hopper, Tarnished Plant Bug, and Squash Bug. The remaining case contained samples of six of our most common and most injurious scale insects, viz., Oyster-shell, San José, New York Plum, Scurfy, Cottony Maple, and Pine-leaf scales.

3. Six or eight cases of common fungus diseases such as Late and Early Blight of Potatoes, Apple Scab, etc.

4. Thirty of our most noxious weeds, mounted on standard sized sheets.

5. Dominion Seed Case, containing one hundred seeds, among them those of all the above thirty noxious weeds.

6. Seven flat vials, containing the life history of the frog. (This went with only one of the exhibits.)

7. Samples of Bordeaux Mixture and of the Lime-sulphur Wash.

All the specimens, except those in the large show-cases, had carefully prepared typewritten labels beneath them, giving the name and a brief note on the nature and habits of the specimen. Mr. Jarvis, Mr. Caesar, and Mr. Crow divided the work of attending the fairs and helping the local agricultural representative. Mr. Jarvis attended the Perth and Collingwood Fairs; Mr. Caesar went to Morrisburg, Winchester and Lindsay; Mr. Crow to Essex.

At each place a suitable part of the agricultural pavilion or hall was reserved and was neatly fitted up with cheese-cloth and bunting with the object of making the exhibit the centre of attraction. Placards were also used to indicate the nature of the exhibit and its source.

It was very noteworthy to see the interest the exhibit aroused among the farmers: from morning till night both the College and local representatives were kept busy answering questions about noxious weeds, injurious insects, and other agricultural subjects that naturally arose.

In regard to weeds it was found that while almost every farmer seemed to be much interested in the subject, a number of them had but little idea of the names of even our commonest weeds; for instance Perennial Sow Thistle was often spoken of as Ox-eye Daisy. From the numerous weeds that were on view before them and from the use of the excellent book "Farm Weeds" recently prepared for the Dominion Department of Agriculture by Dr. James Fletcher, we were able to do much to help the farmers to recognize what weeds were the most injurious and also to suggest to them methods of eradicating not only these weeds but weeds in general.

Those chiefly inquired about in Eastern Ontario were the Perennial Sow-thistle, Couch Grass, Ox-eye Daisy (bad in some districts), Wild Mustard, Blueweed, Canada Thistle, Wild Vetch, or Wild Pea, Bladder Campion (especially around Lindsay), Curled Dock, Ragweed, Wild Oat and Bindweed. It is worthy of note that Bindweed, perhaps our most difficult weed to eradicate, is creeping in all over the Province, though as a rule it has not got a very extensive footing on the individual farms yet. Perennial Sow-thistle will soon be almost as common as the Canada Thistle and is causing much anxiety to the farmers.

In Western Ontario practically the same weeds are asked about with the addition of Rib-grass (*Plantago lanceolata*) or buck-horn as it is often called.

While on the one hand questions about weeds were in the majority in the districts east of Toronto, on the other hand at Collingwood and Essex, fruit growing districts, questions about insects and fungus diseases were the more common.

In the Eastern districts, however, a good many questions were asked concerning the following insects: Grasshoppers (Locusts), Red-humped Caterpillar, Cabbage Worm, Potato Beetle, Turnip Flea Beetle, Fall Web-worm, Oyster-shell Scale, Aphids of various kinds, White Fly, Maple Borers, Wireworms and Buffalo Carpet Beetles. Inquiries were also made about Pear Blight and the fungus diseases known as Early and Late Potato Blights, and Apple Scab.

Throughout the Eastern district very little spraying of any kind seems to be done in orchards except in the splendid apple orchards along the shores of Lake Ontario.

In the Western districts almost every kind of injurious insect was brought up at one time or another for discussion, among them being the San José and Oyster-shell scales, Codling Moth, Aphids, Plum Curculio, Variegated and other Cutworms, White Grubs, etc., etc. Most of the common fungus or bacterial diseases attacking fruit trees or vegetables were also inquired about, and many questions were asked concerning the proper way of making spray mixtures. It was disappointing however, to find a large number of fruit-growers doing absolutely nothing to check some of the worst of our insect pests, such as the San José Scale and Codling Worm. Farmers of this class, we are glad to say, are becoming fewer each year.

In addition to the exhibits mentioned above, Mr. Jarvis took a much larger one to the Toronto Exhibition at the end of August and again to the Fruit and Flower and Honey Show in November. At the latter of these especially he was constantly kept busy answering questions in regard to almost every insect and fungus disease that he had represented and that was to be found in fruit-growing districts.

While much of the work done this year at the different fairs was almost wholly an innovation, yet it revealed a field in which there lie great possibilities for the future. The interest taken by the farmers in the exhibits shows that a great deal of much needed information can be given in an attractive and convenient way by some such method as the one used this autumn.

The farmers, however, were not the only persons who took an interest in the exhibit; at every fair a large number of teachers who had taken up Nature Study spent a good deal of time examining the insects and getting information on many points in which the entomologist could help them. In some cases they brought interested pupils to see insects with which they were not previously familiar, and asked the instructor to show the pupils how the cyanide bottles were made and the insects prepared for mounting.

But it was not the public alone that were learners. Those in charge of the exhibits felt that their intercourse with the farmers and others had taught them many new and valuable ideas, and helped them to get closer into touch with the agriculturists of the Province, and so to be able to fulfil better the ideals of usefulness that they have before them.

Lecture in Toronto. On the evening of November 13th, Mr. Jarvis addressed the members of the Ontario Fruit Growers' Association on Fruit Insects in Victoria Hall, Toronto. The following species were discussed: Apple Maggot, Pear Leaf-blister mite, Fruit Bark Beetle, Codling Moth, Fall Webworm, Apple Aphis, American Tent-caterpillar, Red-humped Caterpillar, Cankerworms, San José Scale, Peach-tree Borer and Codling Moth. Most attention was given to the Apple Maggot and the Codling Moth. The Apple Maggot is spreading in Western Ontario and is likely to become a very destructive pest. The Codling Moth seems to be increasing from year to year. Some of the fruit growers have had good results from spraying while others gave very unsatisfactory reports.

The Insectary. It has been a great disappointment to us that the new glass-houses have not yet been completed, and that we are unable to make any use of the Insectary which should be a very great help in the carrying on of experimental and research work. We hope next year to conduct many investigations in parasitism, fungus diseases of insects, breeding and tracing out life histories, and artificial methods of repressing injurious species, for which we have at present no facilities or equipment. The Insectary should furnish all needful space and the proper conditions for work of this kind.

The Museum. In the Natural History department not much has been done during the past year. A pair of Turkey Buzzards, taken near London, have been added to the collection of native birds, and a number of small mammals have been secured through Mr. J. A. Morden, of Hyde Park Corners, who is an enthusiastic naturalist and an experienced collector. It is hoped that before long there may be a complete series of examples of all the smaller animals of Ontario. The collection of Insects is being steadily improved and increased.

Entomological Society of Ontario.

The headquarters of this Society have now been established for a little more than a year in the Ontario Agricultural College. Its valuable library, and extensive collections have proved most useful in the Biological work of the College, and are constantly referred to by the teaching staff and the more advanced students. Two general meetings of the Society have been held, the first at the beginning of July when those who came from a distance were hospitably entertained in the College buildings through the kindness of the President. A number of papers were read and discussed, and addresses were given by Dr. Fletcher of Ottawa, Dr. Henry Skinner of Philadelphia, and Mr. Nash of Toronto. The attendance included the Summer School of Ontario teachers and the students who were still in residence. The second day was devoted to an excursion to Puslinch Lake, where interesting collections were made and short addresses given by the leaders on the insects and plants that had been found.

The regular annual meeting of the Society was held on October 31st and November 1st. The two days were fully occupied with addresses and discussions on fruit-tree insects and others of economic importance, together with some papers of a more strictly scientific character. A public meeting was held each evening; at the first Mr. A. H. Kirkland, of Boston who is in charge of the work, gave a most interesting description of the operations that are being carried on by the State of Massachusetts for the suppression of the Gypsy and Brown-tail moths. On the second evening an illustrated lantern lecture was given by Dr. E. M. Walker of the University of Toronto on the Dragon Flies of Ontario which were collected and studied at the Georgian Bay Biological Station. These meetings, which bring to the College men who are eminent in their respective departments of Entomological Science, cannot fail to be of the utmost value in arousing the enthusiasm of the College students, and affording them instruction and information that must prove an inspiration and a guide in their own incipient work.

I may repeat in conclusion what I said last year regarding the ability and industry of my colleague, Mr. Tennyson D. Jarvis. His devotion to the work of the department in all its details, his ready assistance and cordial co-operation, have been of the greatest possible help to me, and have assuredly been of immense value to the students in the various years who have been under instruction in Zoology and Entomology.

Respectfully submitted,

CHARLES J. S. BETHUNE.

PART VII.

THE PROFESSOR OF CHEMISTRY.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit herewith the annual report of the Department of Chemistry for the year 1907.

TEACHING.

The chemistry taught covers a very large field, including, as it does, Organic and Inorganic Chemistry, and Applied Chemistry in relation to soils, fertilizers, crops, cattle feed, dairying, insecticides and fungicides, etc.; in fact, all work in connection with farm life. We also give a course of three periods a week, from the middle of September to the middle of June, on the Chemistry of Foods to the senior classes in Domestic Science. This, together with the instruction given to students in the various short courses, forms an important part of the work of the department, and consumes a very large proportion of our time. As there has been no change in the subjects taught, and as the courses have been somewhat fully outlined in previous reports and in College curriculum, it will not be necessary to give any synopsis of the subjects taught at this time.

For the past few years we have been very much in need of more laboratory space to carry on our class work. I am glad to report that the addition to the Chemical building, so generously provided by yourself and the Minister of Agriculture, is now nearly completed, and that we shall have full use of it during the winter term. Perhaps it will not be out of place to give a brief description of the new laboratories:

The main addition is 75 feet long and 33 feet wide, two stories and a basement. One room in the basement, 30 ft. by 20 ft., has been fitted up especially for determination of nitrogen in the various classes of materials that we have to examine. The balance of the basement space, 30 ft. by 51 ft. is to be provided with tables on which geological specimens may be placed, in order that the students may see and handle the various rocks mentioned in the lecture work. On the main floor there are two laboratories and a wide students' entrance hall. The larger of the two laboratories, 30 ft. by 51 ft., is fitted with all the modern conveniences for quantitative analyses and provides ample table space for forty-eight students to work at once. The other laboratory is specially arranged for teaching of chemistry in relation to dairying. This room will be used by the senior students specializing in dairying and by the men taking the regular short courses in dairying the beginning of each year. In previous years this work has been carried on in a room in the basement not at all suited for the purpose. On the second floor there is a small class room with seating capacity for forty-eight; a laboratory for the use of the men taking the Chemistry and Physics Option; a room for the stenographer; and a milling and flour testing laboratory. These different rooms are all well furnished and complete in every way. I am confident that the increased facilities will not only make the teaching easier, but it will be possible to make it more thorough and more profitable to the students.

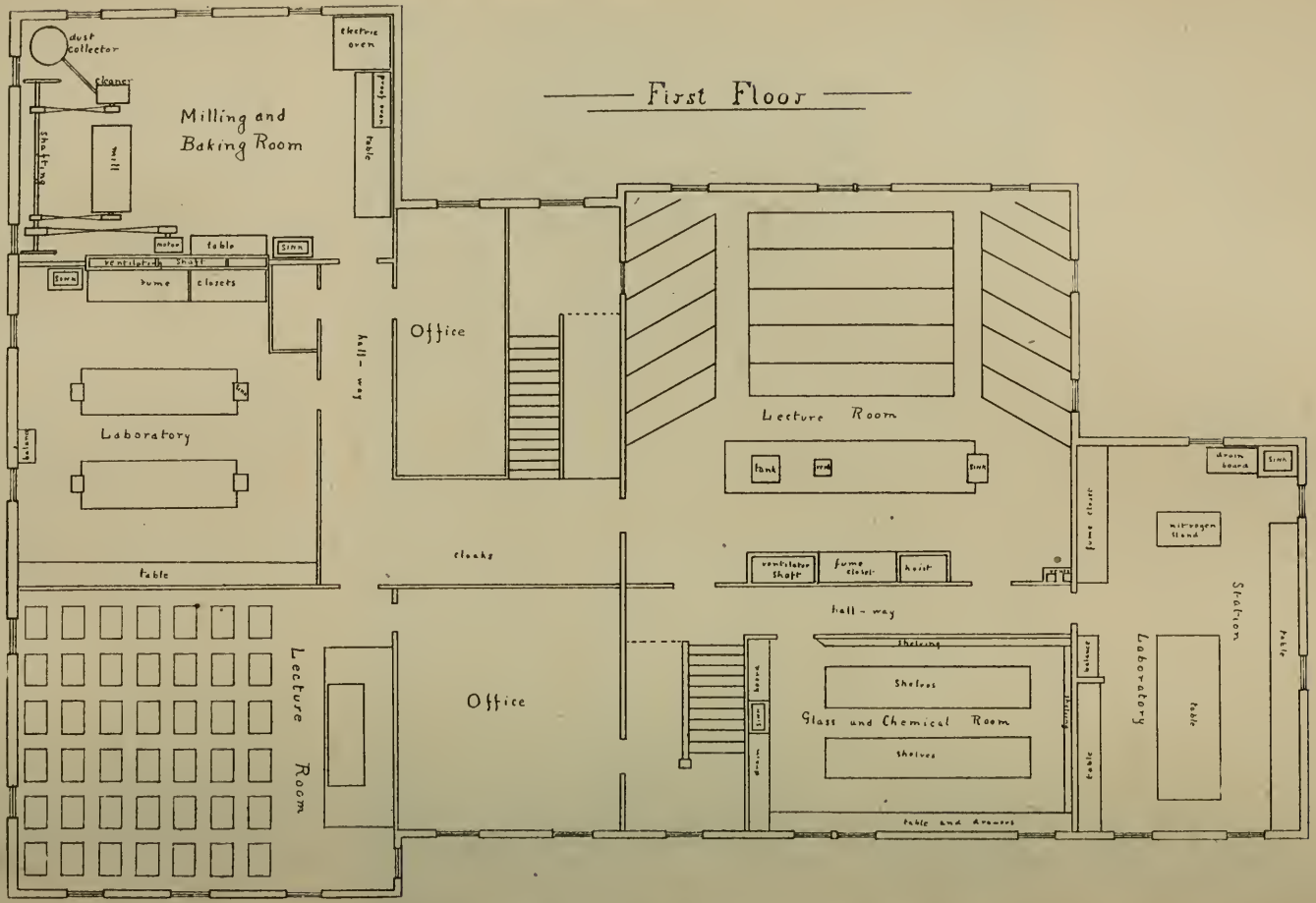
The division of the work of teaching has been about the same as in the past. Mr. Gamble, Lecturer in Chemistry, has taught the Inorganic and Animal Chemistry, the Dairy Chemistry to the fourth year men specializing in Dairying, and the Geology. With the help of Mr. Fulmer, I have taught the Organic and Agricultural Chemistry, Chemistry of Insecticides and Fungicides, Chemistry of Foods in the Domestic Science course, and the Dairy Chemistry to the men taking the short course in Dairying. Mr. M. F. Coglon, B.S.A., who succeeded Mr. G. G. White, B.S.A., as Fellow in Chemistry, has rendered efficient service in assisting in every way with the preparing of materials for class and in general analytical work.

The Chemical Building, showing the new addition.

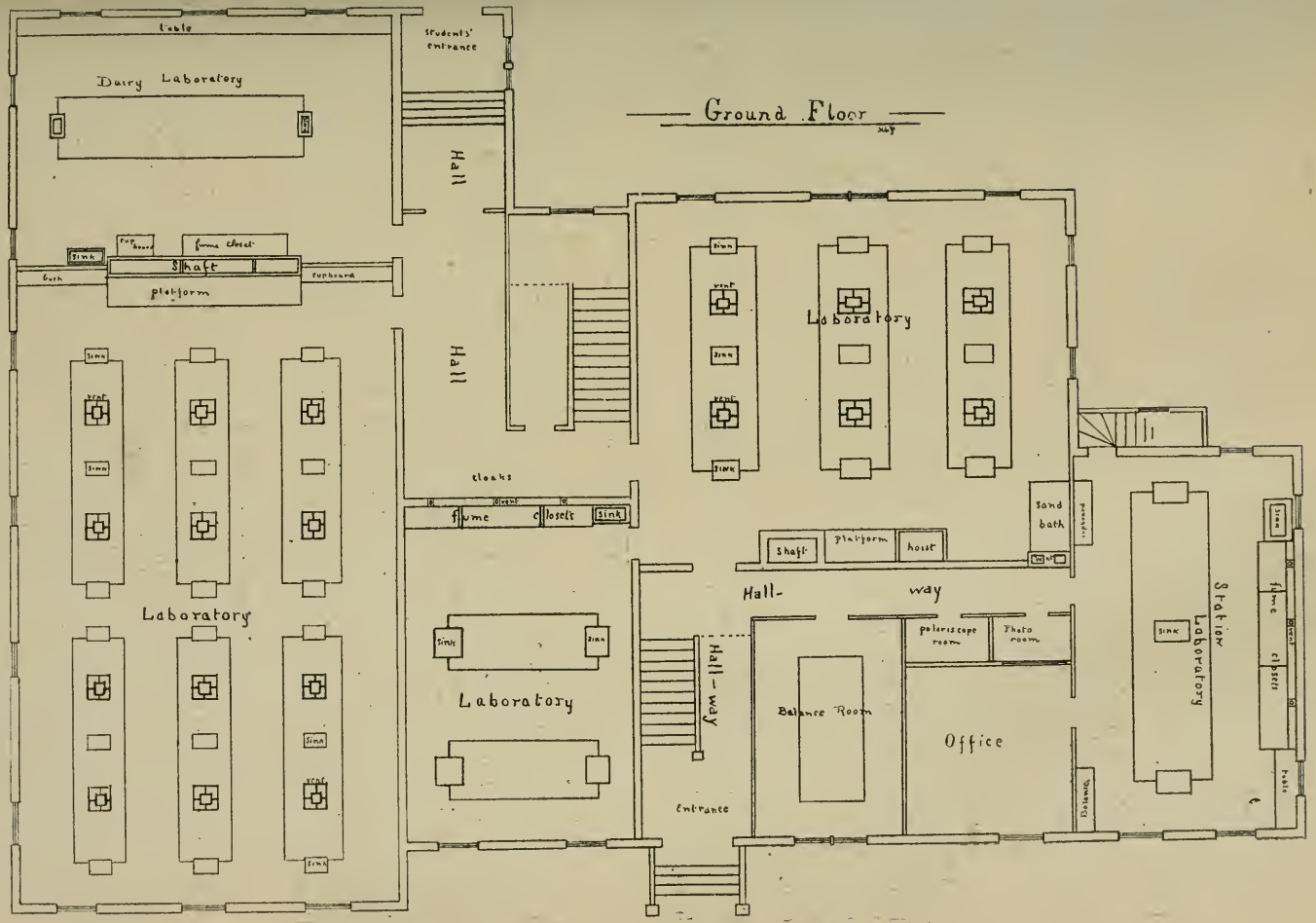
In June, Miss Jean MacPhee, a graduate of our Department of Home Economics, was appointed to take charge of the work in the milling and flour testing work of this department. She has since resigned, and Miss M. A. Purdy, also a graduate of the Macdonald Institute, has been appointed as her successor. This change in a line of work which requires expert manipulation has prevented the carrying out of some investigation work which I had hoped would be undertaken before this.

Miscellaneous Work.

A very large part of my time is devoted to general correspondence, preparing bulletins, writing articles for the agricultural papers, and addressing various farmers' meetings and the conventions of Dairymen, Fruit Growers, Bakers, Millers, etc. This part of my work is continually increasing, and year by year consumes a large proportion of my time.



Chemical Building, at Ontario Agricultural College, Guelph.



Chemical Building, at Ontario Agricultural College, Guelph.

During the past year the following bulletins have been prepared:

Insecticides and Fungicides.

Fertilizers and Their Uses.

Breakfast Foods: Their Composition and Digestibility.

Chemistry in Relation to Incubation of Eggs.

I also prepared a report on the Investigation into the quality of the Potatoes grown in the Maritime Provinces as compared with those grown in Ontario.

We have again this year co-operated with the Association of Official Agricultural Chemists in the study of methods of analysis of agricultural products. This year the work selected was on the determination of Moisture and Nitrogen in cornmeal and oil cake.

A large number of miscellaneous samples of a great variety of substances have been examined during the year. I am desirous of making this part of the work of the department as useful as possible and, therefore, invite farmers and others interested in soils, manures, foods, dairy products, etc., to correspond with us. We cannot always make the analysis requested, partly because of the amount of work entailed and partly because the samples sent have not been selected in such a way as to accurately represent the material of which it is a part; but we shall in all cases give the fullest information we can.

Very many of the samples sent in and analysed were of such a nature that, while the results were of value to the individual sending the sample, they would not be of sufficient general interest to warrant a detailed report here.

Water Analysis.

While we have somewhat discouraged farmers from sending in samples of water for analysis, we have this year received more samples than usual. Of the total number received, fully one-third proved to be unfit for domestic purposes. On many farms the wells are, for convenience sake, near the buildings. For a long time the soil will act as a filter and purify the water, but it will in time become clogged and contaminated; consequently, it is quite probable that many of the old wells are furnishing water unfit for use for domestic purposes. Such being the case,, it is, probably, our duty to assist farmers in ascertaining this fact. We shall, therefore, in future, analyse samples of water free of charge, provided they are taken according to directions.

Fertilizers for Sugar Beets.

It is impossible to grow sugar beets successfully on poorly prepared land, and without giving the crop the most thorough cultivation the whole season. With crops of this nature, it is particularly necessary for the farmer to secure maximum results, for the cost of seeding, thinning and cultivating will be about the same whether the crop is a good one or not. It is on crops of this kind that fertilizers ought to give the most economical results.

With the object of ascertaining the effect of fertilizers on this crop, we placed seven experiments with farmers growing beets for the Ontario Sugar Co., Berlin. In each experiment there were two one-acre plots. No. 1 received no fertilizer, while No. 2 received 300 pounds of superphosphate, 100 pounds of sulphate of potash, and 75 pounds of nitrate of soda. By an

arrangement with the experimenters and with the factory authorities, the beets from each plot were delivered at the factory separately, and an accurate account kept of the weight of beets delivered, the per cent of tare, and the per cent of sugar in the tared beets. The results thus obtained were strictly under factory conditions. The following are the yields per acre of tared beets, the per cent of sugar, and the cash value of the crop on each plot:

Results of Experiments with Sugar Beets.

Expt. No.	Plot.	Yield per acre, tared weight lbs.	Sugar. p.c.	Value.
1	No. 1	15,576	13.8	$35.78
	" 2	20,312	14.0	47.32
2	" 1	23,738	14.5	57.24
	" 2	26,714	15.0	66.78
3	" 1	30,251	15.3	77.14
	" 2	31,777	14.8	78.23
4	" 1	22,370	15.5	57.77
	" 2	24,746	14.8	60.92
*5	" 1	25,838	15.4	66.72
	" 2	29,403	15.0	73.50
6	" 1	20,862	13.8	47.88
	" 2	21,500	14.4	51.49
†7	" 1	33,339	16.0	88.90
	" 2	36,158	16.3	98.23
	" 3	32,183	15.9	85.28

*No nitrate of soda used.

†This experiment was arranged as follows:

Plot No. 1 received:— 75 lbs. nitrate of soda.
200 " superphosphate (20% available).
" 2 " 75 " nitrate of soda.
200 " superphosphate.
200 " muriate of potash.
" 3 " no fertilizer.

As the fertilizers used on Plot No. 2 cost nearly eight dollars, it will be seen that there was not sufficient increased returns in all cases to pay for the fertilizers used; but it must be remembered that the materials supplied would probably influence the yield of the succeeding crop, and, furthermore, all the experimenters reported quicker germination, enabling them to thin about three days sooner. This would be of great importance in an unfavorable season.

Tomato Refuse.

The proper disposal of the refuse from the rapidly increasing canning factories is becoming a live question. At the present time it is disposed of in various ways, some of which are satisfactory and others unsatisfactory. Perhaps the refuse which causes the most trouble is that from the tomato. In some cases it is flushed into the adjoining river or bay, in others it is allowed to accumulate near the factory until it becomes a nuisance, while in other cases it is drawn away and spread over the land. The difficulty with this latter method is that the refuse is thought to be of so little value that it is hard to get the farmers in the busy season to take it.

To ascertain the manurial value we analysed a sample of tomato pulp, which is composed principally of skin, and found that the dried matter contains the following percentage amount of fertilizer constituents:

Nitrogen (N)	2.54
Phosphoric acid (P_2O_5)	3.28
Potash K_2O	.64

We had no opportunity to ascertain the per cent. of water in the material as it would leave the factory, but assuming that it would contain 75 per cent. of moisture, the percentage amounts of the different constituents would then be as follows: Nitrogen, .64; Phosphoric acid, .82, and potash, .16. Farmyard manure containing 65 to 80 per cent. of water will have .45 to .65 per cent. of nitrogen, .2 to .4 per cent. of phosphoric acid, and .4 to .8 per cent. of potash. It will be noticed that the tomato pulp compares very favorably with farmyard manure in the amount of these constituents. It is, of course, well known that farmyard manure is valuable for other things, and we would not wish to be understood as giving tomato pulp an equal value. Tomato pulp may be applied on almost any soil, but if used in very large quantities, it may possibly have an injurious effect upon clay soils, although even large quantities would not be detrimental on sandy soils.

Rapid Methods for Determining Moisture in Butter.

The last few years there has been considerable agitation among dairymen for some quick method for the determination of moisture in butter. As a result two or three rapid methods have been devised. We have thoroughly tested these methods in comparison with the old method of drying in the water oven. At my request, Mr. H. L. Fulmer has prepared the following description of the method and the results obtained from them:

As several methods for the rapid determination of moisture in butter have recently been brought to notice, methods specially devised for the use of practical butter makers and for those interested in the handling of butter, it was thought that it would be of value to those concerned in the butter industry were we to spend some time in examining these methods, in order to find out whether or not they would be applicable to the purpose for which they are intended. This we decided to do, and we wish here to publish the result of our work.

The main essential of any method for the determination of moisture is, of course, accuracy; but combined with such a feature it is desirable that the method shall also admit of easy manipulation, be practicable, *i.e.*, call for no particular skill in manipulation, that it require apparatus which shall be durable, that it be reasonably inexpensive, and, what is most important, perhaps, that it really be a rapid method.

The most promising methods which we have so far examined are "The Beaker Method," as given by H. D. Richmond,* and since improved by Patrick;¶ and "Gray's Method,"§ with both the original and the improved apparatus; and it is these methods which we shall discuss.

*"Dairy Chemistry," 1899, p. 252; and Laboratory Book of Dairy Analysis.

¶Journal American Chemical Society, July, 1907, Vol. XXIX, p. 1126. The method is more fully described in the same journal, Vol. XXVIII, No. 2, p. 1611, *et seq.*

§This method was worked out by Mr. C. E. Gray, Assistant Dairyman, Bureau of Animal Industry, U.S. Department of Agriculture. His original apparatus is described and directions for its use given in Circular 100 of the Bureau while the Wagner Glass Work of New York City, in their illustrated price list, describe both the original and improved apparatus, give prices, and print in full directions for using.

To gain some idea as to accuracy we determined moisture in a number of butters and checked the results by means of figures obtained from the same sample, using the official standard method outlined in "Methods of Analysis" adopted by the Association of Official Agricultural Chemists. The following table gives in detail the results of these determinations. In most cases the table also shows duplicate figures and from a study of these some idea can be gained as to the constancy of results which it is possible to obtain by use of the different methods.

Comparison of Methods of Determining Moisture in Butter.

Sample.	Official Method.	Beaker Method.	Gray's Method Original.	Gray's Method Improved.
1	13.3	13.1	.....	.....
2	14.0	14.2	.....	.....
3	17.0	17.5	.....	.....
4	13.4	13.3	.....	.....
5	15.5	15.9	.....	.....
6	13.6	13.8	.....	.....
7	14.1	14.4	.....	.....
8	14.6	14.5	.....	.....
9	13.1	13.4	.....	.....
10	13.0	13.1	12.5	.....
	.....	13.2	12.6	.....
11	13.4	13.7	13.0	.....
	.....	13.8	12.6	.....
12	13.1	13.5	12.4	13.2
	.....	13.3	12.8	13.4
13	14.8	14.7	14.6	15.0
	.....	14.7	14.3	15.0
14	14.3	14.3	13.7	14.2
	.....	14.2	13.6	14.2
15	13.5	13.4	13.0	13.8
	.....	13.8	12.9	13.6
16	14.4	14.4	13.8	14.4
	.....	14.6	13.9	14.4
17	11.3	11.6	10.6	11.2
	11.4	11.5	10.5	11.1
18	11.3	11.6	10.4	11.0
	11.3	11.6	10.4	11.0
19	11.5	11.5	10.6	11.1
	11.5	11.6	10.6	11.1
20	11.2	11.3	10.3	10.9
	11.2	11.5	10.2	10.9

There is no question as to the accuracy of the official method. Results obtained by its use are absolutely correct, except in so far as they are modified by inevitable experimental errors, in sampling, weighing, etc. Therefore, any method which gives results which correspond with those obtained by the official method must be considered accurate. Looking over the above table, it will be seen that the results from both the Beaker method and Gray's Improved method compare very favorably with those from the Official method. The Beaker method tends to give results which are a little too high, but the greatest error shown only amounts to 0.5 per cent. and most of the results correspond almost exactly with, or differ only so slightly from, those of the standard that the difference might easily be due to experimental error. On the other hand, Gray's improved method inclines to give results slightly too low, but, here again, the greatest error is only 0.4 per cent.. and the same remarks concerning the Beaker method will apply

here also. These two methods are certainly remarkably accurate, and can without any hesitation be highly recommended for commercial and factory work. The original Gray method gives results which are much too low (as much as 1.0 per cent. in sample 20) to be reliable. It is thought that the low results obtained by this apparatus are due to the fact that the graduated neck presents too small a condensing surface and that it is for this reason only that it falls behind the Improved method in accuracy. This must be true, because both these forms depend upon exactly the same principle for the recovery of the moisture. For the writer's part, he greatly prefers the older form, because of the much clearer reading which it gives and because of the accompanying apparatus not being quite so cumbersome. But for the reason just given above and for the additional reason that it requires a glass stopper which is easily lost or broken and which cannot be handily replaced if such a thing occur, the original method must give place to the later one.

In ease of manipulation the Beaker method has the advantage because of the much simpler apparatus which it requires. It is also much less expensive, both as regards first cost and as to maintenance and durability. A simple aluminum beaker, which is practically indestructible under the conditions of the test, and a pair of iron tongs are all that is required, aside from the sensitive balance and the alcohol lamp, both of which latter are indispensable in all cases; whereas the Gray method requires several pieces of glassware which are easily broken even with the best of care, and requires as well chemical reagents, which become exhausted and must be replenished from time to time. As far as regards economy of time in making estimations, neither method has any advantage, both requiring from 15 to 20 minutes only, for carrying through a determination, including weighing out sample, heating and cleaning. The Gray method has an advantage over the Beaker method, however, in that it requires no record of weights to be kept (except in special cases). The method calls for a definite weight of butter, just as does the Babcock test for estimating the fat in milk, and the per cent. of moisture is read off directly from a graduated neck, just as with the Babcock test bottle. Thus no record of weights nor consequent calculations are required. Further than this, Gray's method calls for the expenditure of less time in cleaning. It is possible to make a great number of determinations without doing more cleaning than emptying the liquid fat from the flask after each time, whereas with the Beaker method thorough cleaning and drying must be accomplished after each individual test.

In conclusion, we wish to state that the two methods, the Beaker and Gray's improved, supply rapid means for determining moisture in butter. They are both sufficiently perfected to enable anyone with an average degree of intelligence and skill to obtain results by them which shall be approximately true. We are inclined to recommend the Beaker method because of its greater simplicity, durability, and economy. Neither one will admit of application in exact inquiries, but for the study of factory problems in relation to moisture and for the control of the local and export market product either one cannot fail but prove to be of inestimable value.

Our Milling and Flour Testing Department.

Some time ago a joint committe of the Dominion Millers' Association and the Master Bakers' Association waited on the Minister of Agriculture and obtained from him the promise to establish an up-to-date wheat and flour testing plant at the College. This plant is now in operation, and it

has been thought well to prepare a brief outline of the need of such a plant, the nature of the work which we hope to do, and a description of the various appliances used in the work.

Few people realize the wide differences that exist in the quality of the numerous kinds of flour on the market. The average housekeeper may buy a pastry or a bread flour, but does not know the variations in strength of the flour used for the latter purpose, nor of the difficulties the miller has to contend with in producing a grade of flour that is uniform in strength from month to month.

The quality of a flour for bread-baking purposes is dependent upon even granulation of the particles of the flour, color, and the quantity and quality of the gluten. The production of flour of even granulation is entirely a milling problem; the color of a flour is influenced by the nature of the wheat used and by the milling process, but it is practically under the control of the miller; while what is known as *strength* in flour is almost entirely dependent upon the inherent qualities of the wheat, or, in other words, on the amount and quality of the gluten. It is true good wheat may be spoiled in the milling, but this is seldom or never the case where the miller knows his business. As the gluten content of wheat varies very widely in different varieties and in wheat grown in different localities and in different seasons, it is probable that the wheat delivered at the mill, whether by wagon or by railroad cars, differs very widely in the qualities required for the production of a strong flour. Millers soon become familiar in a general way with the quality of flour that may be made from certain varieties of wheat, or from the wheat grown in different localities, and generally mix or blend the stronger with the weaker wheats and in this way produce a grade of flour of fairly uniform quality throughout the year. But without accurately conducted tests, experienced as the miller may be in judging flour by feel and by doughing tests, he cannot be absolutely sure of the result.

Owing to differences in climatic conditions and possibly to other influences, wheat grown in one season may produce flour of a very different quality from that of another. One year the flour may be characterized by low yield of bread, another by poor expansion in the loaf, slow fermentation, etc., all of which are due to inherent qualities of the wheat and entirely beyond the control of the miller. From all accounts the wheat grown in the western provinces this past season is of a very varied quality, and it is natural to expect that the flour will also be widely different in quality. The mixing of the wheat in the elevators will, to a certain extent, overcome this natural variation, but it is quite probable that the flour on the market this year will not be as uniform in quality as might be desired, unless extra pains are taken to ascertain the strength of the wheat being ground.

Because of these variations in the strength of flour, the problems of the baker are increased. If flour was always of the same nature and strength the making of bread would be a comparatively simple matter; but, where the flour differs so widely in quality as it is very apt to do, especially at the time of the change from the old to the new wheat, the problem is not a simple one. This is at least partly due to the fact that comparatively little is known about the make-up of the different parts of a flour. We do know that flour contains carbohydrates, fat, ash materials, and gluten, and that we are probably correct in stating that the strength of a flour is in some way dependent upon the quantity and quality of the latter substance, but there are still many points in connection with the gluten and carbohydrate content of a flour that we do not understand. Two fresh, sound flours may

be equal in color and in quantity of gluten and yet act altogether differently when baked. Some of the causes of this difference may be explained as a result of a chemical examination, but the fact remains that there are many peculiarities about the way a flour "works" that cannot be fully explained by the scientific knowledge possessed to-day. It may seem strange that a material that is so generally used and in such enormous quantities has not been more fully studied, but frequently the most common things around us are, after all, the least understood.

Recognizing the assistance a thoroughly up-to-date flour testing plant would be to the miller and the baker in the practical part of their work, and the need of more scientific investigation into the question of "quality" in flour and the problems of bread-making, the Executives of the Canadian Master Bakers' Association and the Dominion Millers' Association waited on the Provincial Minister of Agriculture and asked that such a plant be installed somewhere in the Province. The Minister at once granted their request, and directed that the necessary appliances be purchased and installed in the Chemical Laboratory of the Ontario Agricultural College. This has been done, and the plant has now been in operation for a few months. The plant is essentially the same as that used by some of the larger milling companies on this continent, and consists of a scourer and dust collector, a mill for grinding the wheat, an electric proof and bake ovens, appliances for testing gluten, measuring the volume of the loaf of bread, and all necessary utensils for the proper carrying out of the work.

The scourer is about two feet wide and two feet high, but, small as it is, it has a two-screen shoe for the separation of foreign matter, a fan twelve inches in diameter, and a scouring cylinder eight inches long, and is connected with a small dust collector. By means of this machine we can clean the grain as thoroughly as it is done in the large mills.

The flour mill consists of two pairs of six-inch rolls, a corrugated pair and a smooth pair. These are connected with feed rolls, and by means of a side lever may be brought together or apart as the operator may desire. On the centre of the machine there is an arrangement for sifting or bolting the flour. This may be started or stopped while the machine is running without affecting the rest of the mill. The sifter carries three screens which may be replaced by others of smaller or larger mesh to suit the nature of the wheat being ground or the product desired. They are so arranged that the coarse bran layers are retained on the top sieve and the flour sifted out of the bottom one. There is no purifier attached to the mill, consequently we cannot separate fine light particles of flour or specks of bran as completely as might be desired; but by careful attention to details, we have been able to prepare a good granular flour of excellent color. No attempt is made to separate the flour into the different grades commonly prepared in the larger mills.

The electric proof oven is four feet by four feet by one foot in size, and contains three shelves. It is lined with asbestos and wired in two circuits, so that when both switches are thrown in the oven may be warmed up quickly, and when one switch is withdrawn the temperature may, with very little difficulty, be held at any desired point.

The electric bake oven is three feet square, inside measurement. The walls are lined on the inside with Russian iron and between this and the outer oak walls there is four inches of asbestos, thus insuring almost complete insulation. The wiring of the oven has been done in such a manner as to spread the heat from the electric current evenly throughout the oven and is of sufficient quantity to cause the temperature to be quickly raised to the required point.

To measure the expansion, or size, of the loaf, it is placed in a box of known capacity and all the vacant space filled with small seed. At the bottom of the box there is a slide which may be drawn and let the seed fall down into a box with a long neck arranged in such a way that an accurate measurement of the seed may be made. The difference between the cubic contents of the first box and the amount of seed required to fill the space not occupied by the loaf must of necessity give the volume of the loaf.

In our comparative bread-making tests, nothing but water, salt, sugar, and yeast are mixed with the flour. Twelve ounces of the flour to be tested is mixed in a bowl with sufficient water containing the other ingredents to form a slack dough. This is placed in the proof oven at a temperature of 60° F. until sufficiently risen to indicate that it is ready for kneading. The kneading is done in the hands, thus overcoming the loss of material that might be incurred by working on the table. After a second kneading, the dough is allowed to stand until ready for the pans. It is then placed in the pans and baked for one hour at a temperature of 360° F. The bread is then allowed to cool, after which it is weighed, the volume of the loaf determined, and then cut and judged for quality. In these comparative tests, the yeast is used in what might be considered excessive quantities. The object is to cause the dough to rise as high as possible and thus bring out the strength of the flour. The expansion, or the size of the loaf, is afterwards determined, and this, together with the texture of the bread, forms the basis for the judgment of the strength of the flour. The pans are made narrow so as to cause the loaf to take a high form in order to afford a better opportunity of judging the power of the dough to expand. The use of electric proof and bake ovens renders it possible to have almost complete control of the temperature and, consequently, to carry out these comparative baking tests under uniform conditions. The flour tests also include a determination of the per cent. of wet gluten and the amount of water the flour will absorb.

When this work is done by an experienced person, the slightest difference in the quality of flours may be determined. In every case a standard flour of the same grade or blend as the flour to be tested is baked and the results are reported in per cent. of the standard. The following is a sample of the reports sent out:

	Standard Patent	Sample tested No. 1	Sample tested No. 2	Standard Bakers	Sample tested	Standard Blend	Sample tested
Gluten	32.33	32.40	32.00	34.00	35.00	28.76	27.00
Absorption	62.00	64.00	62.00	65.00	62.00	55.00	55.00
Yield of Bread	100.0	100.0	100.4	100.0	98.0	100.0	100.0
Volume of Loaf	100.0	92.0	100.0	100.0	98.0	100.0	95.5
Color	100.0	100.0	100.0	100.0	99.0	100.0	100.0
Texture	100.0	99.5	100.0	100.0	100.0	100.0	100.0
Quality of Loaf	100.0	99.5	100.0	100.0	99.0	100.0	100.0
Average Values	100.0	99.5	100.1	100.0	99.1	100.0	99.1

It was not the wish of the committees that asked for the installation of this flour testing plant, nor the intention of the Minister of Agriculture when he granted their request, that the work should be done free of charge. After consulting several members of the Executives of the two Associations,

we have decided to place the fee at two dollars per sample for grinding the wheat and testing the flour, and one dollar for testing the flour alone. Although only twelve ounces of flour are used in the baking test, we ask for three pounds of flour and five pounds of wheat. This is done in order that there may be sufficient to duplicate the work, if such be deemed advisable.

We are now in a position to aid the miller by determining for him the strength, or the quality, of the wheat he expects to mill. If he intends grinding a mixture of western spring wheat with a softer Ontario winter wheat, we can assist him in finding out what will be the best proportions to mix these grains to give him the desired results. We can also be of service to him in testing his output of flour from time to time to see that it is uniform in quality. In these and many other ways, we can directly aid the miller in his work. Further, there are many problems in connection with the milling business that we may help him to solve. For instance, it is contended by many that hard and soft wheat should not be mixed before grinding, but rather that they should be ground separately and then the flours blended. This is a point which we expect to take up at once. Another point we expect to investigate is the milling quality of the different varieties of wheat grown in Ontario. We have tested the flour ground in our own mill from the different varieties grown on the experimental plots at the Ontario Agricultural College during the season of 1905 and 1906, and some very interesting results have been obtained. The problems of blending the soft Ontario winter wheat with the hard spring wheat of the West will also be studied.

To the baker we can be of assistance in testing flour that may not be "working" satisfactorily, and make plain whether the fault lies in the flour or in his process of manipulation. We may also be able to furnish him with some information regarding how a particular flour should be handled, or in providing him with definite information upon which to base a complaint to the miller. We also hope to help him solve some of the deeper problems of the bread-making processes by gaining a fuller knowledge of the chemical differences in flour, and their direct effect on the making of bread.

To both the miller and the baker we promise to give all work sent to us careful and prompt attention, and we trust that the use made of this flour testing plant will prove that the Executives of the two Associations were warranted in asking for the installation of the plant, and that the Minister of Agriculture will not regret having granted their request.

Investigation Work.

The three lines of investigation work to which we have devoted the most attention this year are, the composition and cooking qualities of potatoes, chemistry in relation to incubation of eggs, and composition and digestibility of breakfast foods. As a report of the work done on these investigations has been made to you, it will not be necessary for me to give any detailed results here. I have, however, made a brief statement of the work done and the results obtained.

Potato Work.

Last spring, Mr. C. C. James, Deputy Minister of Agriculture, instituted an inquiry into the reasons why such large quantities of potatoes grown in the Maritime Provinces are annually brought into Ontario. In

connection with this investigation, I was instructed to collect and analyze samples of potatoes grown in Nova Scotia and New Brunswick and in this Province, in order that we might ascertain if there was any difference in the composition of the potatoes that would throw any light on the subject. We analysed and determined the cooking quality of eighty-one samples of potatoes, fifty-three of which were grown in Ontario and twenty-eight in the Maritime Provinces. A full report of the work has been published in the Farmers' Institute Report for 1906. It may be of interest at this time to quote the following paragraph from the conclusions drawn from the table giving the cooking quality and the chemical composition of the potatoes examined.

A study of the data presented in the two tables seems to indicate that mealiness in the potato is not associated with high proteid; in fact, it would appear as though low proteid and high starch content are the desired factors in quality, especially in mealiness, of the potato. With reference to these points, it is worthy of notice that the average proteid content of the Ontario potatoes analysed is 2 per cent. higher, and the starch 4 per cent. lower than in those received from the Maritime Provinces. Also that the average total figures given for quality are 7.1 lower for the former than for the latter. The greater part of this difference is made up in the column showing the mealiness of the potato. If we compare the marks given for mealiness of potatoes containing 10 per cent. or lower of proteids, we find that, with very few exceptions, they stand over 30, with several above 37, whereas comparatively few of those containing higher quantities of proteids received as many as 30 marks.

Chemistry in Connection with Incubation of Eggs.

In co-operation with three other departments of the College, we have devoted considerable time to some of the problems in connection with the incubation of eggs. The particular phase of the question studied the past summer was with reference to the lime content of the shell, white, and yolk of the egg and of the young chick. The investigation has not been completed, excepted in so far as we have established the fact that the amount of lime in the young chick is from five to six times that contained in the white and yolk of the eggs and, consequently, that the lime of the shell must be absorbed during the process of incubation. The results also indicate that the larger the quantity of lime in the chick, the greater the vitality. A report of progress of the work done has been made and will appear, along with the reports of the other departments interested in bulletin form, at an early date.

Breakfast Foods.

During the last two years we have devoted a large amount of time to the study of breakfast foods. In this investigation, we analysed nearly one hundred samples of foods, and carried out forty-six successfully completed digestion experiments. We also determined the efficiency of the "malting" or "predigestion" process and the thoroughness of the cooking to which the ready-to-serve foods have been submitted, as indicated by the solubility of the foods, and obtained some figures with reference to the influence of long and short periods of cooking on the composition and digestibility of oat and wheat meals.

Although there is such a large number of breakfast foods on the market

they are practically all made from five kinds of cereal grains. The great majority of those used in this country are made from two—oats and wheat—and nearly all the ready-to-serve type are prepared from one, wheat. The chemical composition of the various foods shows that the method of preparation has not materially altered the proportion of the different nutrients of which they are composed, and that they correspond closely with the grain from which they were made. The exceptions to this are that in the oat product the amount of crude fibre has been reduced by removing the hull, and that in preparing the finer grades of cornmeal, the bolting process removes a portion of the fat. Whole wheat has about the same amount of crude fibre as the prepared oatmeals, and the farinas have a part of this removed. Many persons consider that since the bran layers of the wheat contain so much protein and ash material, they should be retained, even if the presence of the associated crude fibre does decrease the digestibility of the food. There would probably be some reason for this contention, especially when fed to young people, if these farinas formed the whole of the diet, but the ordinary mixed diet probably furnishes all the mineral matter which a healthy person requires. Moreover, the presence of crude fibre may injuriously increase peristaltic action, although, on the other hand, it may be useful in cases of constipation. The breakfast foods prepared from oats are rich in protein and fat, and those of corn are rich in carbohydrates and poor in protein fat. Rice is poor in protein and ash and rich in carbohydrates, containing very little crude fibre, while barley contains a fair proportion of all the nutrients without an undue proportion of crude fibre.

The proportion of the various constituents of the different forms of breakfast foods digested does not differ very widely. Even the so-called "predigested" foods are not more completely digested than the others. What difference there is would go to show that they are not so fully absorbed as the oat and wheat meals when properly cooked.

Thorough cooking is an important factor with starchy foods, and, consequently, with all the breakfast foods. It not only makes the food more palatable, but it also breaks down the walls of indigestible fibre which surround the starch granules and the other nutrients, and in general produces changes which render the food more susceptible to the action of the digestive juices, thus probably increasing the ease and rapidity of digestion, and, to some small extent, the completeness of digestion. From the results obtained in our work, it would appear that the farinas do not require so long cooking as the rolled oats or cornmeal. Further, judging by the solubility of the organic matter, some of the much advertized prepared foods are not so well cooked as might be desired; for while twenty minutes cooking is not considered sufficient to properly prepare oatmeal porridge, it was found at the end of that time to contain more soluble matter than some of the prepared cooked foods, and nearly as much as some of the cooked and malted preparations. Farinas cooked for the same length of time were, with one exception, about as soluble as all of the so-called "predigested" foods examined. The percentage amount of soluble matter in a food may not form an absolutely correct basis for judging the efficiency of the cooking or malting process; but, as these processes tend to render certain parts of the food soluble, it certainly gives us a good basis of comparison. If this be true, we are right in concluding that some of the prepared foods should be further cooked before serving.

As regards palatability, one food does not seem to have much advantage over another. The mere fact that all are bought and used is sufficient evidence that they are palatable. Certain foods may "agree" with some people

better than others. That is, after all, a matter of individuality, and each person must choose for himself; but with the great majority of people who use breakfast foods regularly, it is doubtful if the newer "malted" or "predigested" foods are more tasty or palatable than the older fashioned oat and wheat porridge. The cost of the numerous kinds of breakfast foods varies widely. The price per package may not be very different, but there is a wide difference in the actual weight of material in the packages of the different brands of these foods; and this, together with the differences in composition and digestibility that exist, is sufficient to render the actual nourishment obtainable from some foods very much more expensive than others. This is very clearly brought out in the following table, which gives the number of grams of potein and carbohydrates contained in, and the fuel value of the digestible matter of, ten cents' worth of each of the foods.

NUMBER OF GRAMS OF DIGESTIBLE PROTEIN, CARBOHYDRATES, AND NUMBER OF CALORIES FROM 10 CENTS WORTH OF THE FOODS.

Food	How sold	Price	Grams of digestible Proteids	Grams of digestible Carbohydrates	Calories
Granulated Oatmeal	In bulk	7 lbs. for 25c.	118.3	885.1	4,922
Rolled Oats	" "	7 " " 25c.	127.1	874.1	4,915
" "	" package	2 " " 10c.	90.9	624.1	3,510
Farinas	" bulk	6 " " 25c.	75.9	806.3	3,860
"	" package	2 " " 15c.	41.8	448.0	2,146
Wheat Germ	" bulk	7 " " 25c.	118.9	950.5	4,861
Rolled Wheat	" "	6 " " 25c.	73.9	793.4	3,784
" "	" package	2 " 13 ozs. for 15c.	57.8	619.8	2,964
Flaked Barley	" bulk	2 " for 10c.	59.6	683.1	3,035
Cornmeal	" "	8 " " 25c.	70.1	1,175.1	5,316
"	" package	3 " " 10c.	62.6	1,049.2	4,746
Orange Meat	" "	20 ozs. " 15c.	26.9	279.3	1,341
Force	" "	16 " " 15c.	18.0	219.0	1,010
Norka	" "	22 " " 15c.	48.5	282.7	1,578
White Bread	" loaf	2½ lbs. " 10c.	90.4	546.8	2,817
Entire Wheat Bread	" "	2½ " " 10c.	71.5	473.3	2,418
Graham Bread	" "	2½ " " 10c.	73.7	443.7	2,322

It is evident that in many cases the market price has little connection with the nutritive value, or even with the cost of the materials and preparation. The uncooked oat, wheat, and corn meals, especially those bought in bulk, are the cheapest per pound, both in weight of nutrients purchased and in the amount absorbed by the system. It is possible that the cost of cooking may be sufficient to materially offset this advantage; and that the convenience of the ready-to-serve food may compensate for the higher cost. These considerations must. of course, vary with circumstances, and each person must decide them for himself.

In general, it may be stated that the various forms of breakfast foods on the market are all wholesome and nutritious foods. At present prices the uncooked oat, wheat, and corn meals are among our most economical sources of nutrients and energy and, taking everything into consideration, it is probable that oatmeal ranks highest among these. It may not "agree" with everyone, but for those who can use it, there is no breakfast food which combines high protein content and energy producing qualities so well as

oatmeal. The prepared breakfast foods are more expensive, and evidently not because they contain any more nourishment, but because of the way they are prepared, the manner they are put upon the market, and the expense incurred in advertizing. A curious name or appearance or a mysterious process of preparation, does not give them the extraordinary food value sometimes claimed. They may have a place in a hurry-up breakfast, but where economy is considered there is nothing in the composition, digestibility, or palatability of these high priced "predigested" foods to justify the extravagant price asked for some of them.

Uncompleted Work.

Testing Milling Qualities of Ontario Fall Wheat. With the object of obtaining some definite information regarding the best milling varieties of wheats grown in this Province, we have made regular baking tests with all the varieties that we could get of the wheat crop of 1905 and of 1906, and we intend testing all the varieties grown on the Experimental Plots in 1907. Along with these baking tests we shall make determinations of the amount of alcohol soluble proteids and shall do other work to see if we can ascertain whether there are any chemical differences in the proteids of these different varieties of wheat which vary so widely in breadmaking qualities.

Lodged Grain. In past reports we have referred to the fact that we are studying the causes of the lodging of grain. For many years large acreages of grains, oats particularly, have been partially destroyed by lodging. This past season was drier and the lodging was not so serious. We have in the Laboratory at present some materials collected from this last years' crops which we intend to examine as soon as we can get time for the work. We hope that we shall be able to get some definite information regarding the cause of the lodging and be able to suggest some method of treatment that will overcome the trouble.

Lime and Sulphur Wash. The lime-and-sulphur wash is now generally accepted as the most practicable and efficient remedy for San José Scale. Among fruit growers, however, there is a diversity of opinion regarding the details of preparation of this insecticide. Some prepare the wash by boiling a definite length of time; others are guided by the color produced as a result of boiling. We feel confident that the lime from different parts of the Province is not all equally suitable for the purpose, as, for instance, lime produced from dolomite rock, which contains magnesia, is not so suitable as lime from the pure calcuim carbonate rock. It is quite probable that the coloration that is got as a result of the boiling is due to some impurities, such as iron, and does not indicate completeness of combination of lime and sulphur. We are, therefore, making a study of the whole question, and shall determine the amount of sulphur and lime combined with various lengths of time of boiling, the efficiency of limes got from different parts of the Province, the causes of the greenish color, etc., etc.

In conclusion, I beg gratefully to acknowledge the co-operation of the various College departments in the carrying out of our years' work.

Respectfully submitted,

R. HARCOURT.

THE LECTURER IN CHEMISTRY AND GEOLOGY.

To the President of the Ontario Agricultural College:

SIR,—I beg to submit herewith a brief report of my work for the year 1907.

As a general outline and scope of my class work has been given in former reports, I shall not take up space with a recitation of facts already known. Permit me, however, to offer a brief word of explanation with reference to our methods of teaching Chemistry to students of Agriculture.

TEACHING.

In the higher institutions, such as our own, the first course is general and descriptive chemistry, of which every person who expects to engage in any scientific pursuit should have a thorough knowledge; and, as has been generally agreed upon, this subject should have a prominent place in college courses. Concerning details of the most efficient methods of teaching general chemistry, no doubt an extended course of experimental lectures, closely connected with laboratory practice, affords the best training. To carry out this idea, our laboratory work is so arranged that the lectures of each week shall include the experiments for the laboratory. We also endeavour to conduct weekly recitations on the subjects of the lectures and laboratory work, thus enabling us to control the progress of our class. When the students first enter the laboratory it is essential that they be impressed with the necessity for accuracy in the details of experimental work. This important lesson we endeavour to teach by means of experiments affording quantitative results. It is our firm belief that there should be sufficient instruction in the laboratory for careful oversight of the experimental work and the note book of each student. Moreover, we are convinced that it is unwise, in any grade of undergraduate study in chemistry, to allow students in laboratories without constant supervision. When left to themselves they are apt to loiter, to contract careless habits, and to waste material. I regret that we are not as yet in a position to insist upon adherence to such rule, because of want of assistance.

In addition to the above I desire to add that, while methodical habits are to be strenuously insisted upon, the methods may be sufficiently flexible to allow the student to reach his conclusions in his own peculiar way; the particular form of lecture and laboratory notes, for example, we leave to the preference of the student, provided they are well written and complete.

INVESTIGATION.

Our investigations during the year have dealt with the ash constituents of the sugar beet and beet-pulp, the composition of by-products, condimental and stock-feeds, and co-operative work in methods of analysis of agricultural products.

ASH CONSTITUENTS OF BEET-PULP.

Of recent years many experiments have been conducted in different sections of Ontario to ascertain whether the soil and climate are suitable for the profitable growing of beets for sugar production. Prof. Harcourt has already reported the results of the investigations along this line, and as an outcome of the favorable results of these investigations, a new industry has sprung up. The introduction of the beet sugar industry in sections of Ontario has

disturbed the routine of farm practice, and has created a new avenue for the output of agricultural products; and by-products of this industry have furnished a new stock feed. It will, therefore, be helpful to the farmer to know what will be the probable influence of sugar beet growing on the fertility of the soil, and also to know what value beet pulp has, as a stock feed. With a clear undertsanding of these questions, the farmer will be enabled to avoid wasteful practices, and to adopt a course of economy. In last year's report we discussed the latter question, and it is the object of this article to bring together certain experimental data, and to interpret these with a view to answering the former.

It has been said that sugar beets do not exhaust the soil to any noticeable extent, because the crown of the beet which is left on the farm, contains the greater portions of the ash. This is what has been alleged. The results of experiments here in the laboratory go to show that the crown contains a somewhat higher percentage of ash than does the factory portion of the beet.

Six sugar beets, of medium size, and of various shapes, were selected from a pile of beets grown on the experimental plots at the Ontario Agricultural College. Great care was taken that the whole of the crown and root were attached, and that no incisions or rupture had been made wherein soil might lodge. These beets were scrubbed and washed scrupulously clean of earth, and any remnant of leaves were removed. The crowns were then separated from the factory portion, by cutting across the beet so as to include that portion containing all the leaf-scars with the crown portion. By grating each portion separately, drying and grinding the two samples were prepared for analysis. These two samples, in duplicate, were burned according to the method introduced by Dr. Shuttleworth some years ago. The duplicate results were quite uniform, and the average results showed that the per cent. of ash in the dry matter of the crown portion of the sugar beets was 6.92, while in the factory portion it was 5.68.

From these figures it is evident that there is but little difference between the ash content of the crown and the factory portion, and, therefore, it cannot be said that the larger portion of the ash remains in the crowns, since there is so much more of the factory portion than of the crown. It is true, however, that the leaves are very rich in ash, for their dry matter contains as high as twenty per cent. of ash. Nevertheless, the portion that is used at the factory contains a large quantity of fertilizing constituents. The following table gives a comparison of the fertilizing constituents contained in the saleable portion of various common crops:

Amounts per Acre of Fertilizing Constituents found in Average Yield of Certain Crops.

Crop.	Yield per acre.	Nitrogen.	Phosphoric acid.	Potash.	Value.
	tons.	lbs.	lbs.	lbs.	
Mangels	20	76.0	36.0	152.0	$18 26*
Turnips	17	61.2	34.0	132.6	15 33
Sugar Beets	14	61.1	28.0	134.4	15 23
Clover Hay	2	82.8	15.2	88.0	14 95
Timothy Hay	1¾	44.0	18.6	31.4	7 60
	bushels.				
Wheat	30	42.5	14.2	9.0	6 11
Barley	38	27.3	14.4	8.8	4 28

*Based on the percentage of fertilizing constituents as compiled by Henry in "Feeds and Feeding."

And the same valuation is used as Armsby uses in his "Computation of Rations for Farm Animals," viz., nitrogen, 12 cents per pound; phosphoric acid, 4 cents per pound; potash, 5 cents per pound. As the valuations are based upon the cost of commercial fertilizers, they must not be taken as absolute.

This table shows that an average crop of sugar beets removes a smaller quantity of fertilizing constituents than an average crop of mangels; about the same as turnips and clover hay; and much more than timothy hay, wheat, or barley. Seldom are mangels, turnips, or clover hay sold from the farm; hence, of the crops ordinarily sold, the sugar beet is the most exhausting upon the soil, when there is nothing returned for what has been removed.

If the fertility is to be maintained, about the same quantity of fertilizing constituents as is removed in the crop must be restored to the soil. This maintenance of fertility may be accomplished either by returning the beet pulp, by purchasing other stock feeds or manure, or, partially, by growing leguminous crops. Beet pulp makes an excellent constituent of a ration (see Report for 1906), and it should be returned to the farm and fed wherever practicable. As it leaves the factory it contains generally about 90 per cent. of moisture, but by improved presses, the moisture may be reduced to 80 per cent. Even with the water reduced to 80 per cent., the pulp cannot be carried with profit long distances from the factory. Every ton of the pulp will contain from 1,600 to 1,800 pounds of water; and, therefore, the expense of transportation per 100 pounds dry matter is very great. Whenever the pulp can be returned and fed to the stock with profit, no farmer should fail to return it.

But the fertilizing value of the beet pulp is not so high per 100 pounds of dry matter as is that of the sugar beet before it is subjected to the process of sugar extraction. The statement that the beet sugar industry, since it sells nothing but sugar from the community, does not remove from the land any elements of fertility, is not strictly correct. Three samples were analysed here in the laboratory, one from the Berlin factory; another from the Wallaceburg factory; while the third sample was the factory portion of the sugar beet to which reference has already been made. The analysis of each sample was made in duplicate, and the figures obtained were as follows:

Per Cent of Fertilizing Constituents.

Sample.	Per 100 pounds Dry Matter.	
	Ash.	Nitrogen.
Beet Pulp (Berlin factory)	4.08	1.60
" (Wallaceburg factory)	4.47	1.65
Average of Beet Pulp	4.28	1.62
Factory portion of Sugar Beet	5.68	1.87

To every 100 pounds of dry matter in the sugar beet, as taken to the factory, there are 1.40 pounds more ash and .25 pounds more nitrogen than in the same quantity of dry matter in the beet pulp. In order to compensate for the loss in removing 100 pounds of dry matter in sugar beets from the farm, if there were no other losses except at the factory, 133 pounds of dry matter in pulp must be returned. But there are other losses to consider;—

inevitable losses in feeding and handling must not be overlooked; so that, after making due allowance for all losses, there should be returned from 140 to 150 pounds of dry matter in pulp for every 100 pounds of dry matter in the beets removed.

Until the factories dry and grind the pulp to meal, farmers living at a distance from the factory cannot expect, on account of the cost of hauling, to return the pulp to the soil. It is necessary, therefore, to maintain fertility by some other means. For example, other feeding-stuffs may be purchased and fed, and the manure therefrom applied to the soil. The quality of these feeds required to supply the loss in selling sugar beets will vary according to:

(1) The quantities of the different fertilizing constituents contained in the seed.

(2) The class of animals to which it is fed. Growing animals and milch cows remove quite a large percentage of nitrogen and ash, while fattening animals remove but little of either. By referring to a table of the fertilizing constituents of the purchased feeds and by taking into consideration the class of animals to which the feed is to be supplied, and the probable loss in the manure, it may be readily calculated how much of the feeds are required to compensate in fertilizing constituents, for that removed by the sugar beets.

In order to maintain fertility, where it is not practicable to purchase other feeding-stuffs, the purchase of manure must be resorted to. Farmyard manure is a general manure, and where it can be procured at reasonable cost, it is probably better than the mineral manures. Besides containing the fertilizing constituents in very fair proportions, it has the advantage over the mineral manures of supplying organic matter, thus exerting a very beneficial influence upon the mechanical condition of the soil. To supply the loss, through the sale of a crop of sugar beets (of the average yield), in the form of sodium nitrate, superphosphate, and Kainite, these fertilizers must be supplied in the respective quantities of 400 pounds, 112 pounds, and 1,030 pounds per acre. It is not within the scope of this article to discuss the problem of the application of these fertilizers; but it may be mentioned here that in order to obtain their full value, and to prevent disastrous losses, they must be applied with an intelligent knowledge of their respective actions on the soil and on the growth of the crop.

It has become well recognized that leguminous crops, such as clover and peas, increase the fertility of the soil. By growing these crops it is possible to keep up the nitrogen supply more economically than by the application of artificial fertilizers. But it would never do to depend upon these crops for the supply of other fertilizing constituents, except for the small quantity brought from the subsoil and deposited either in the roots near the surface, or in the crop itself. The long tap roots of the clover and alfalfa extend more deeply into the soil than those of the other crops. Leguminous crops, however, are essentially nitrogen suppliers.

Conclusions.

(1) The statement that most of the ash of the sugar beet is contained in the crown which is left in the field is shown by analyses to be incorrect.

(2) The sale of sugar beets without returning the beet pulp is very exhausting on the soil; the pulp, therefore, should be returned to the farm whenever it can be fed with profit.

(3) There is in any case a loss of fertilizing constituents from the soil in a district where beets are grown for the production of sugars.

Ash Constituents of Cereals.

When plants are subjected to chemical analysis their constituents are divided into combustible and incombustible matter, the latter usually being designated the ash. The figures given in this paper are the results of two methods of making a determination of the percentage and the analysis of the ash of a crop, and these results indicate that the figures representing the amount and analysis of the ash of different crops as given in our reference books are, to a certain extent, inaccurate. But of what importance is an ash analysis? The three main plant constituents of which the soil may become exhausted are: nitrogen, phosphoric acid, and potash; and when we consider the fact that the ash contains all of the last two, we can readily see that the accurate determination of the percentage of ash in a crop and the percentage composition of the ash are questions, which, in relation to soil fertility and soil exhaustion, are of the most vital importance both to the scientific and practical agriculturist.

A method by which accurate ash percentages and analyses may be obtained has been, among all agricultural chemists, a long felt want. In burning a substance to an ash according to the official method, chemical changes take place which greatly alter the real quantity and composition of the ash. Natural products, as straw, hay and grain, contain large amounts of carbon to drive off which a high degree of heat is required. This high heat causes portions of the ash to fuse or liquidize, in which state, some of the constituents, as the potash, lime, iron and magnesium unite with the silica to form silicates. These silicates are insoluble in hydrochloric acid (the solvent used) and thus the analyses show a lower percentage of these constituents and a higher percentage of silica than the ash actually contains. Then again this high heat causes some of the phosphoric acid, chlorine, and sulphur to volatilize and thus the figures for these substances are lower than they should be.

Some years ago Dr. A. E. Shuttleworth, then chief chemist at the Ontario Agricultural College, recognizing these defects in the chemical analysis of an ash, endeavoured to obtain a method by which some of the errors might be rectified, and we are pleased to say that the method, devised by him, overcomes in part, at least, the defects in the official method which have just been mentioned. In the report of this College for 1899 he says: "To obtain a method giving accurate ash percentages and analysis, I conducted an extensive series of analysis of natural products (straw, hay, grain, etc.), and artificial silicates. In these analyses attention was given first to the determination of crude ash in a sample of oat straw by the ordinary method of incinerating the dry material in an open platinum dish. During the process, different degrees of heat were employed with different samples. Those samples receiving the highest heat yielded the lowest percentage of ash, and those gently heated yielded the highest. But the ash prepared by the high heat yielded high percentages of silica and low percentages of potash, while ash prepared by the low heat yielded high percentages of potash and low percentages of silica. An analysis of the silica separated from the highly heated ash showed that it (the silica) contained portions of the other ash constituents, viz., lime, magnesium, potash, etc. This circumstance led me to prepare mixtures of pure silica, potassium carbonates and calcium carbonates of known quantities, which after being moistened with citric acid and dried, were subjected to different degrees of heat corresponding to the conditions in regular ash determinations by the ordinary method. An analysis of these mixtures, after heating, gave results quite similar to the results of the above samples of ash prepared from oat straw, *i.e.*, the highly heated mixtures yielded high

percentages of silica, owing to the lime and potash of the mixtures uniting with the silica and forming silicates, which are indecomposable in hydrochloric acid.

"After trying many substances, I found that the addition of a solution of acetate of lime to the dry substance prevented the formation of indecomposable silicates during incineration at any temperature."

By this extract, from Dr. Shuttleworth's report, we see that the addition of a solution of calcium acetate apparently obviates the difficulty of burning a substance to an ash, and prevents the union of the lime and potash with the silica.

Having found a means of preventing the formation of insoluble silicates the Doctor endeavoured to discover a method of preventing the volatilization of chlorides. He eventually designed a special form of apparatus composed of platinum and provided with lids, cylinders, and openings in which, he claims, that the material, moistened with acetate of lime solution and dried can be completely incinerated without the slightest loss of chlorides.

Having briefly considered the difficulties met with in making an ash determination and analysis, let us now turn our attention to the results obtained and see what conclusions we can draw from them. The figures below represent the analysis of the ash of Herison Bearded Wheat. This is a winter wheat and was grown under ordinary field conditions. The percentage of ash has been calculated on the amount of water free substance and the percentage of ash constituents on the amount of carbon free ash. The figures obtained are as follows. The figures by Wolff representing the composition of the ash of wheat are also given.

Analysis of Ash in the Grain.

	Shuttleworth Method.	Official Method.	Wolff.
Per cent. of Ash	2.21	2.00	1.96
" SiO_2 in Ash	1.17	2.46	1.96
" Fe_2O_3 "	2.40	1.52	1.28
" CaO "	4.71	2.17	3.25
" MgO "	10.00	7.15	12.03
" P_2O_5 "	33.26	31.23	47.22
" K_2O "	26.51	18.43	31.16
" SO_3 "	1.81	2.26	.39
" Na_2O "	9.10	11.41	2.07

Chlorine undetermined.

Analysis of Ash in the Straw.

	Shuttleworth Method.	Official Method.	Wolff.
Percent of Ash	9.45	5.75	5.37
" SiO_2 in Ash	28.31	49.17	67.50
" Fe_2O_3 in Ash	2.01	1.90	.60
" CaO in Ash	8.25	6.24	5.76
" MgO in Ash	4.10	2.20	2.48
" P_2O_5 in Ash	3.50	2.35	4.81
" K_2O in Ash	39.13	16.42	13.65
" SO_3 in Ash	2.69	1.75	2.45
" Na_2O in Ash	15.25	18.97	1.38

Chlorine undetermined.

From what has been said previously regarding the effectiveness of the new method in preventing the volatilization of chlorids, etc., and in preventing the formation of insoluable silicates, it should be an easy matter for us to draw certain conclusions from these figures. In the first place we get more ash by the new method; having .21 per cent. more in the grain and 3.70 per cent. more in the straw. The loss in ash by the official method is due to the volatilization of the phosphoric acid and chlorides. In the second place, we see that there is quite a variation in the composition of the ash as determined by these two methods. We call the attention of the reader, more particularly to the variation in the amounts of silica, lime, potash, and phosphoric acid, as these, from an agricultural standpoint, are the most important constituents. For the sake of convenience we give the amounts of these again.

Substance	Method.	SiO_2 p. c.	CaO p. c.	P_2O_5 p. c.	K_2O p. c.
Grain	Shuttleworth's.....	1.17	4.17	33.26	26.51
"	Official	2.10	2.17	31.23	18.43
Difference .	.....	.....	2.54	2.03	8.08
Straw.....	Shuttleworth's.....	28.31	8.25	3.50	39.13
"	Official	49.17	6 24	2.35	16.42
Difference .	.....	.....	2.01	1.15	22.71

In each case we get more silica by the official than by the new method, having .93 per cent. more (nearly twice as much) in the grain and 20.86 per cent. more in the straw. But in each case we, on the other hand, get more lime, phosphoric acid and potash by the new method. In the straw we have over twice as much potash by the new method and also have quite a quantity (8.08 per cent.) more in the grain. We get 2.54 per cent. more (over twice as much) lime in the grain by the new method and 2.01 per cent. more in the straw. In both cases we get more phosphoric acid by the new method. This greater amount of phosphoric acid is due to the prevention of its volatilization. Part of the potash by the official method is lost by volatilization but the greater part of the loss of this substance, as well as the loss of time, is due to the formation of insoluble silicates. The addition of the calcium acetate solution, as previously stated, prevents the fusing together of certain salts and thus the ash remains in a form in which it is easily dissolved by hydrochloric acid. The alkali neutralises the large amount of silicic acid in the straw and the phosphoric acid in the grain.

Let us now consider very briefly the figures given by Wolff representing the analysis of winter wheat and compare them with our figures. Naturally, you will expect them to correspond favorably with the figures in the column headed "Official Method," but it will be noticed there is considerable variation. There are several ways by which this variation can be accounted for. In the first place, our figures are the results of the analysis of but one crop while those given by Wolff are the average results of a great many analyses. Then, again, the amount and chemical composition of the ash of a crop is influenced, to a greater or less degree, by the species, the stage of growth, the soil, the fertilizers used, the available moisture and the thickness of the stand. Hence it will be seen that the figures by Wolff, given above, will be of little use to us without some other data and, therefore, in the following table will be found three columns of figures, the first representing the ash

analysis of the straw of Herison Bearded Wheat as obtained by the Shuttleworth Method, and the second giving the average analysis and the third the variations in the analyses of the ash of the straw of winter wheat as compiled by Wolff.

VARIATIONS IN THE ASH ANALYSIS OF WINTER-WHEAT STRAW.

	Shuttleworth Method.	Average.	Variation.
	%	%	%
Total Ash	9.45	5.37	4.5—7.0
$Si O_2$	28.31	67.50	49.6--72.5
$K_2 O$	39.13	13.65	9.5—27.4
Ca O	8.25	5.76	2.7—8.9
$P_2 O_5$	3.50	4.81	2.2—8.9

It will be seen upon comparing these figures that the results obtained by the Shuttleworth method are very conclusive. The maximum amount of ash ever obtained by any official method is 7%, while, by the new method, we obtained 9.45%. The minimum amount of silica ever obtained is 49.6% while we, by the Shuttleworth method, obtained 28.31%; then again, we obtained by the new method 8.25% of lime as compared with a minimum of 2.7%, a maximum of 8.9% and an average of 5.76% obtained by official methods. We can say nothing definitely in regard to the phosphoric acid.

Before the time of DeSaussure, this subject, the chemical analysis of the ash of plants, had been given a great deal of attention by agricultural chemists. The inaccuracies occasioned by the combustion of the organic matter were recognized by such men as Baumert, Councher, and Von Schroder, who, in order to make accurate sulphur determinations, recommended the use of a specialized alcohol lamp for incineration. Then again W. Mayer found that, by adding potash and saltpeter to the substance before incinerating, he could save a large quantity of the sulphur, and Elbricht, with the same object in view, treated clover leaves, by heating in nitric acid and drying and then incinerating with saltpeter and potassium carbonate, for the same purpose. Many different forms of apparatus have been proposed to regulate the admission of air to the substance (chlorides, sulphides, etc.) while being burned, and, at the same time to retain the volatile substances. The Shuttleworth platinum dish used in this work is one of these. An apparatus similar to the one devised by Dr. Shuttleworth was at the same time proposed by Tucker. The main chamber of the Tucker apparatus is conical in shape and the air, instead of being forced in, is drawn through by means of an aspirator. To catch the volatile substances the air drawn off is passed through a small flask containing water. The platinum stirrer passes down the inlet tube. This apparatus is becoming more popular and more generally used than the Shuttleworth apparatus, owing, doubtless, to its simplicity of construction and ease of operation. The conical form of the Tucker apparatus is also preferable, as it allows the heat to be applied more uniformly. H. Wislicenus recently described an apparatus which embodies the principle of the Tucker apparatus, but consists only of a cover which may be adapted to dishes and crucibles ordinarily found in chemical laboratories.

Besides a solution of calcium acetate, with a known calcium content as used by Doctor Shuttleworth, many other admixtures, to facilitate incineration and prevent the fusing of salts, have been used. Kassner mixed cal-

cium plumbate with the dry substance, but this, although facilitating the burning, interfered with the later analysis of the ash. Bismuth Nitrate used by Bechamp gave the same result. Donath employed such admixtures as pumice stone, copper oxide, clay and magnesia, but found them inferior to incineration at first in dilute and later in pure oxygen. H. Wislicenus recently suggested moistening the greyish ash with pure hydrogen peroxide, which he claims facilitates the complete combustion of the carbon. Strecker has employed the addition of baryta, Way and Ogstone, barium nitrate, Slater barium superoxide, Wackenroder lime, as calcium carbonate, and calcium acetate, all with good results. Von Schroder and Reuss added sodium carbonate previous to charring to prevent the loss of chlorine, and sulphuric acid in forest products.

Thus, it will be seen, that the ash analysis of plants is a question which has been extensively investigated by our most prominent chemists. The subject, however, is a very wide and important one, and one which still presents an inviting field for thorough and exact research. Such researches, in the present status of our knowledge, are much to be desired and we hope, that before many more decades of time have passed, we shall have found methods by which the ash of all kinds of plants can be accurately and correctly determined.

CONDIMENTAL AND "STOCK FOODS".

Name of Feed	Crude Protein.	Moisture.	Ether Extract.	Crude Fibre.	Ash.	Nitrogen free Extract.
1. Carnafac	16.09	7.32	3.98	14.11	10.99	47.51
2. Columbia Regulator (Columbia Stock Food Co. (Detroit)	10.72	7.42	5.02	9.52	22.28	45.22
3. International Stock Food	11.06	10.32	2.61	7.90	16.87	52.24
4. Myer's Cattle Spice and Cattle Food	11.27	7.24	1.89	8.93	30.43	40.24
5. Myer's Spice	13.42	12.25	3.47	6.99	18.75	45.12
6. Anglo-Saxon Stock Food (Nesbitt Co., Ltd.)	19.25	8.05	6.44	14.93	10.73	40.60
7. Dr. Hess's Stock Food	12.34	7.48	1.80	7.37	22.41	48.60
8. Stock Compound (Dr. Scott)	14.51	7.20	2.96	7.26	16.06	51.95
9. Pratt's Animal Regulator	9.72	9.21	4.50	4.21	11.35	61.01
10. Bibby's Cream	13.50	10.15	6.11	3.92	4.12	62.20
11. Herbageum Stock Food	21.10	7.15	4.82	9.29	14.03	43.61
12. Stock Food (The Beaver Mfg. Co., Galt)	20.68	6.98	5.32	8.34	13.59	45.09
13. Rust's Egg Producer	19.03	8.82	4.21	5.15	61.30	1.49
14. Dr. Hess's Panacea	11.20	10.41	1.75	3.47	39.04	34.13
15. Pratt's Horse and Cattle Feed	11.63	10.24	2.27	5.31	6.70	63.85
16. Calf Meal (American Cereal Co., Peterboro)	23.27	10.20	2.51	5.54	4.61	53.87
17. Stock Food or Cattle Spice (The Beaver Mfg. Co., Galt)	18.64	8.21	2.77	7.45	6.01	56.92
18. Standard (Ame & Co., Boston)	14.54	11.50	4.59	4.61	5.37	59.39
19. Acme Stock Food	23.51	7.42	7.39	7.04	8.04	46.60
20. Worthington's Stock Food	13.24	8.78	3.25	11.30	12.15	51.28
21. Anglo Saxon Stock Food	19.25	8.07	6.49	14.72	10.76	40.71
22. Anglo Saxon Stock Food	19.91	5.00	8.84	14.71	8.70	42.84
23. Victor Stock Food	12.19	9.41	1.36	12.15	5.22	68.67
24. Canadian Stock Food	14.58	7.88	4.95	10.55	7.56	54.48
25. Columbia Stock Food	11.56	6.39	4.69	9.15	22.11	46.10
26. Dr. Scott's Stock Food	17.15	11.50	5.17	5.47	4.49	56.21
27. Carnafac	14.63	6.93	3.28	13.20	11.46	50.48

The samples of condimental and "stock foods" reported above were secured in most cases from fresh stock out of unbroken packages. In addition to the chemical analysis, a few of the samples were subjected to a careful

microscopic examination. The chemical analysis alone gives valuable information as to the total quantities of important food materials contained in the feeding stuff. But the information obtained from a combined chemical and microscopical examination must be of still greater value to feeders of live stock.

We give the results of our microscopic examination:

Carnafac: Linseed, wheat starch, charcoal.

Columbia Regulator: Wheat starch granules, bran, charcoal.

International Stock Food: Mostly wheat offal, some charcoal, and cayenne.

Myer's Cattle Spice and Cattle Food: Fenugreek, linseed, maze, seeds, etc.

Myer's Spice: Corn, cotton seed meal, seeds, cayenne, fenugreek, saltpetre, sulphur, salt, and turmeric.

Pratt's Animal Regulator: Corn, wheat offal, fenugreek, gentian, salt, charcoal.

Bibby's Cream: Wheat, maize, linseed.

Herbageum Stock Food: Linseed, wheat, charcoal.

We have been unable to find time to make a microscopic examination of the other stock foods listed.

It is not claimed that the number of ingredients identified in the above foods is complete. It is believed, however, that the examination is sufficiently complete to give a fair idea of the general character of such feeds. We have found them to consist largely of ordinary grains and concentrates, as wheat by-products, corn meal, and linseed meal. In some cases linseed and cotton seed meal have been added, obviously to increase the amount of protein. Occasionally mustard hulls and weed seeds are noted, used, evidently, as a filler.

In addition to the various cereal by-products these foods contain small quantities of a variety of substances, most of which possess simple medicinal properties, to which, we understand, is attributed the wonderful nutritive and curative properties claimed for them.

The nutritive value of "Stock Foods" is thus shown to be no greater than that of the ordinary grains of which they are largely composed. Their medicinal value depends largely upon the aromatic seeds and roots used as a tonic for the stomach, on charcoal as an absorbent, and on the purgative effect of Epsom and Glauber salts. The quantity recommended to be fed is usually so small, that very little nutritive effect can be expected unless the material be fed for a considerable length of time. While it is probably true that some of these stock foods may prove beneficial under certain conditions, it is also true that many of them are heterogeneous mixtures, which, from a nutritive standpoint, are in most, if, indeed, not in all, cases not worth more than many of the by-products from our mills. Very few feeders would entertain the idea of purchasing these mixtures at the price asked, because of any particular nutritive value they may possess. Indeed, as feeds, pure and simple, the prices paid for "stock foods" are ridiculously high when compared with the prices paid for our most expensive standard feeds.

Another strong objection to the use of "stock foods" is the fact that they are anything but constant in composition, as chemical analyses have abundantly demonstrated. But it may be objected that the composition of even our standard feeds, bran, shorts, etc., is likely to vary within wide limits—a statement all too true, because of accidental or intentional adulteration. It must be admitted, however, that the purchaser of commercial feeds can, in many or most cases, detect the presence of low grade materials

in bran, shorts, middlings, gluten meal, etc., whereas in the so-called "stock foods" such substances are hidden by finely ground charcoal, anatto, etc. Furthermore, the composition of the standard feeds, bran, etc., if unadulterated, is fairly constant. Hence, it seems only rational to favor the standard by-products for the nutritive effect. It must be admitted, however, that practice has shown that a good stock food has a place in improving the condition of an animal whose system is run down, also in finishing an animal for exhibition purposes, where cost is not the prime consideration.

The question of comparative values of feedstuffs is a live one in Ontario to-day. The shortage of roughage and grains has been the means of causing many feeders of live stock, particularly dairymen, to consider the advisability of purchasing certain commercial feedstuffs, for which, heretofore, they have had little or no use. The direct effect has been to stimulate a spirit of inquiry which demands all our efforts to satisfy. As evidence of this, we may point to some thirty odd feedstuffs which we analyzed during the year at the request of farmers and millers throughout the Province. In this connection I may say that there is an ever increasing demand for such work, and we believe it to be of the highest importance.

As it is scarcely possible to enter into a discussion relative to the merits of the various feedstuffs without some knowledge of the animal requirements, the following facts should be borne in mind. First, the lives of none of our farm animals can be sustained by protein, or fat, or carbohydrates, or ash alone; and yet protein, carbohydrates and ash of the feed are all absolutely necessary to sustain life and produce growth and milk. Experiments proving the above facts teach us that for the securing of specific ends, such as the production of flesh, fat or milk, these several groups of substances, as found in our various feed stuffs, should not, for economical reasons, be fed at haphazard, but rather in reasonably definite proportions, depending on the end sought. Second, a feed is valuable as a source of nourishment only so far as its various constituents can be digested and assimilated. Third, cows of 1,000 pounds weight need approximately 16 pounds of total nutrients daily. Animals that are very thin in flesh, especially when fresh in milk, can consume two or three pounds more to advantage. Of these 16 pounds, approximately 2.5 pounds of protein is necessary, in order to enable the cow to produce large and continuous yields of milk. For milk production, cows need about five times as much carbohydrates as protein. These proportions cannot, of course, be followed with mathematical accuracy. Cows differ in their ability to turn feeds to the best account, and the judgment of an experienced feeder is always necessary if the best results are to be obtained. In all feed combinations palatability must also be carefully considered.

If a cow should be fed all she would consume of any palatable dry, coarse fodder, such as good quality of hay, she would have at her disposal the following digestible nutrients approximately: Protein, 1.4 lbs.; fat, 0.4 lbs.; carbohydrates, 12.4 lbs.; total, 14.2 lbs.

It is very clear that such a ration lacks in protein, as well as in total digestible matter. In order to overcome these deficiencies, recourse is had to the concentrated feeds rich in protein, and sufficient are added to increase the protein to the necessary amount. By this addition of concentrated feeds, the necessary total nutrients will also be obtained. The protein is the most expensive of the three groups of nutrients, therefore the writer is not sure that it would be economy in all cases to feed 2.5 pounds. It is possible that the conditions in many cases are such that two pounds daily would be more economical. In other cases, it might be wise to feed as high as three pounds daily.

Having briefly considered the principles on which a rational system of animal nutrition is based, the next step is to classify the feeds and consider their comparative value.

Below 12 per cent. may be termed low protein, from 12 to 20 per cent. medium protein, and above 20 per cent. high protein. If we examine published analyses of feedstuffs, we shall see that hay is low protein, and this applies to all coarse fodders, excepting the legumes. These latter are medium protein. The grains have the same type of composition as do the hays and straws with this exception, that they contain a much lower percentage of crude fibre, and, hence, are very much more digestible. The grains may be regarded as concentrated hays, having approximately one-third more nutritious matter than the latter. The hays, roots, and grains have from nine to thirteen times as much carbohydrates as protein. The legumes (clover, pea, and bean fodders) contain more protein than do the hays and grains, having about five times as much carbohydrates as protein.

COMMERCIAL FEEDSTUFFS.

	Protein.	Moisture.	Fat.	Fibre.	Ash.	Nitrogen free extract.
Molac horse feed	10.31	8.80	4.14	12.30	6.00	58.45
Molac dairy feed	14.87	7.37	4.68	11.10	5.35	56.65
Bran	15.37	7.81	3.30	7.75	5.28	60.50
Bran	13.18	8.88	3.07	12.32	5.42	57.13
Bran	12.28	9.20	2.50	12.79	4.35	58.88
Bran	11.93	8.74	2.91	13.09	4.47	58.86
Bran	11.20	9.15	2.19	14.10	3.69	59.66
Shorts	15.14	11.32	4.47	7.20	4.65	57.22
Buckwheat feed (bran and shorts)	17.00	11.84	3.28	11.53	3.22	53.13
Buckwheat feed	13.50	13.28	2.90	6.47	2.87	60.87
Gluten feed	23.25	7.68	5.83	5.72	1.14	56.38
Gluten liquid	1.59	87.91	1.03	.43	.22	8.82
Gluten meal	35.41	11.20	2.11	5.35	3.34	54.27
Oil cake (meal)	34.81	9.45	7.42	7.35	5.40	35.57
Linseed meal	23.87	8.90	28.61	6.10	5.39	27.13
Oil cake (nut)	27.54	9.68	4.32	12.17	6.01	40.28
Whole linseed	20.95	7.90	31.98	4.75	3.65	69.23
Malt combings	20.88	10.79	2.32	12.56	5.74	47.71
Corn meal	7.47	10.30	5.37	1.26	1.50	74.10
Cotton seed meal	42.10	8.50	13.01	5.62	7.25	23.97
Beet meal (Wallaceburg)	6.50	8.00	0.88	17.30	4.66	62.66
Rice meal	12.25	9.82	13.70	5.21	7.77	51.05
Rice feed	12.37	9.11	11.55	10.42	8.75	47.80
Feed (Tillson & Co.)	14.20	11.20	4.67	9.62	4.91	55.40
Feed (W. R. Flatt)	11.38	9.04	4.45	8.42	5.51	61.20
Feed (W. R. Flatt)	8.03	9.67	2.51	11.50	3.67	64.62
Sample feed	9.63	14.28	2.00	6.95	7.96	59.18
Bean meal	23.73	11.20	2.11	5.35	3.34	54.27
Molassine	9.63	3.46	0.13	11.28	10.62	65.24
Manitoba weed seeds	13.84	9.82	4.47	4.78	3.19	63.90

In our discussion thus far we have emphasized the importance of protein. This constituent we believe is of prime importance, because, as we have seen, it is the component in which home-grown feeds are likely to be deficient. Commercial feedstuffs, therefore, are valuable chiefly in proportion to the protein they contain. An exception to this must be made in the case of our cereal grains. These have practically the type composition of the various coarse fodders, differing in that they contain much less crude fibre and consequently are much more digestible. They are, therefore, to be used more as producers of fat and energy than as furnishers of protein.

The concentrated feedstuffs in the above table we may divide into three classes, depending on the quantity of protein they furnish. For practical purposes in combining these feeds into rations, those in each class may be regarded as having equal values, the market prices governing the selection. Other things being equal, however, those having the highest protein content in the class are to be preferred.

It must be admitted that some of the feeds on our list give better returns than might be expected from a casual glance at the table of composition. Molac dairy feed, for example, is not amongst the feeds of class I., as regards protein content, and yet our experience with this feed leads us to regard it as a valuable component of a dairy ration. Molac dairy feed is very palatable and cattle eat it greedily. Moreover, when fed to dairy cows instead of bran, the flow of milk was not appreciably decreased. It will not escape notice that this feed is not very different in chemical composition from pure wheat bran. It must be remembered, however, that Molac is a prepared feed and not a pure by-product, hence the composition of the feed is not likely to be constant.

Bran is one of the safest feeds that can be fed to farm animals. It does not cause digestive disorders even when fed in large amounts. It can be combined with and made to improve any kind of feedstuff. It is invaluable as a component of a ration for milch cows, and can be fed to all classes of live stock.

From the analyses given in the above table, it might be supposed that the protein content would put wheat bran into the lowest grade (below 12 per cent.). I may say, however, that the protein content of pure wheat bran rarely falls below 14 per cent., and if the percentage of protein falls below this figure we may be suspicious of the presence of foreign materials. Four out of the five samples of bran herein reported were adulterated with finely ground oat hulls.

The buckwheat by-products find their chief place as pig feeds. The two samples analyzed contain a fair percentage of protein. But the composition of feeds is likely to be quite variable because the material is not in all cases a pure by-product.

Of the maize feeds, gluten meal is the most valuable, as it contains the highest percentage of protein. Corn meal is not a milk producer; but it is an excellent component of a fattening ration. Gluten feed does not contain as high a percentage of protein as gluten meal, and, furthermore, it is frequently found to be heavily adulterated, so that the composition is anything but constant. In our examination of these feedstuffs we have frequently found the gluten feed sold under the name gluten meal, a designation altogether misleading, as the two feeds are quite different. The one, gluten meal, is, or should be, a pure by-product obtained in the manufacture of starch. Gluten feed is a mixture of materials, chiefly germ and hulls of maize, though other materials may also be present.

The flaxseed feedstuffs are all high grade, with the possible exception of oil cake, which in some cases is a heterogeneous mixture. As will be seen from the above analyses the sample of oil cake analyzed was of excellent quality. It is evidently the pure linseed cake. Samples of oil cake have, however, come under our notice which contained linseed and admixture of other seeds, as well as screenings and sweepings from the mill. It is, therefore, better policy to purchase linseed meal, as the quality of this material can be depended upon.

Cotton seed meal is an extremely high-grade feedstuff. It should be fed with caution, however, as amounts exceeding 1 to 1½ pounds fed daily

to milch cows are likely to cause serious derangement of the animal system. In small amounts it is an excellent component of a dairy ration. Cotton seed meal should never be fed to young pigs.

A striking exception to the rule, that feedstuffs with low protein content are of little value, is seen in the case of sugar beet meal. This meal is simply the beet pulp thoroughly dried and pulverized. When this meal is moistened it supplies a succulent food at a time when such feed is either not available or too scarce; and its effect upon stock seems to be much more favorable than chemical analyses would indicate. To its actual nutritive effect as a feed should be added its general effect on the quality of meat and milk. Furthermore, beet meal or pulp undoubtedly overcomes much injurious effects of dry and concentrated feeds, puts the system in a good sanitary condition, and so stimulates the appetite that there is less waste of other feeds, quantities of which are otherwise generally discarded. Beet meal or pulp supplies material which dilutes, softens and separates the particles of dry hay and grain, so that the nutritive quantities of the whole may be greatly increased or rendered more efficient.

The materials labelled "feeds" in the foregoing table require little comment. The analyses show them to differ widely as regards composition. Furthermore, the figures for protein show them to be little better than ordinary farm roughage. A brief analysis of the table reveals that in one case only does the percentage of protein exceed 14. These materials are, therefore, not to be recommended as components of rations for dairy cows. In fact, the prices demanded for "feeds" are in most cases too high.

An analysis of one sample of "stock food" is reported in the above table. As will be noticed, the protein content is very low, so also is the fat. The material is, therefore, low grade. Attempts have, nevertheless, been made to assign to it a higher feeding value than oats or barley. A comparison of the figures given in the above table with those for oats and barley (Henry's Feeds and Feeding) is sufficient to show that such claims are misleading.

The analysis of Manitoba weed seeds herein reported would lead us to regard the material rather favorably. But the feeding of this material has not sustained this opinion. As a result of our work with Manitoba weed seeds we are forced to believe that it is altogether unfit to feed to poultry. Mr. Graham fed this material to a flock of chickens and many of them died. It is believed that the weed seeds contain aromatic compounds which are poisonous to poultry.

In conclusion, permit me to say that although a great deal of labor has been expended in determining the composition and relative values of feedstuffs, yet much remains to be accomplished. We believe it to be a most fruitful field for research, and would, therefore, respectfully call your attention to the urgent need for a larger grant for this work. We feel certain that the results would amply repay any moderate expenditure in this direction.

Respectfully submitted,

W. P. GAMBLE.

November 26th, 1907.

PART VIII.

THE PROFESSOR OF VETERINARY SCIENCE.

To the President of the Ontario Agricultural College.

SIR,—I have the honor to submit my annual report for the year 1906-1907.

CLASS ROOM.

The Class Room work has been practically the same as in previous years.

First Year. To this class during the fall term I gave a course of lectures on Veterinary Anatomy, taking up principally the anatomy of the horse and noting the principal differences between his anatomy and that of the ox. While we do not study anatomy in minute detail we endeavour to give the students sufficient instruction on the skeleton, muscles, tendons, ligaments; digestive, respiratory, urinary and genital systems, foot, eye, and skin, to enable them to be good judges of horses and appreciate the common diseases to which they are subject. We endeavour to make all lectures and illustrations as practical and interesting as possible. To this year we also gave a course of lectures on building stables, as regards site, drainage, ventilation, kinds and arrangements of stalls, floors, etc.; the care and management of horses, harness, vehicles, etc.; and a course in Veterinary Materia Medica, speaking of the mode of action of medicines, the different methods of administering the same, with the advantages and disadvantages of each; the qualities, actions, uses and doses of the drugs commonly used for the prevention and cure of the ordinary diseases of farm stock. In addition we gave practical illustrations of scoring and judging the different breeds and classes of horses, using for such purposes the horses kept at the institution and some from my own stable.

Second Year. To this class I gave a course of lectures on the diseases of stock, noting the causes, symptoms and treatment, both preventive and curative. During this course, when possible, we illustrated by specimens or a living animal, the differences between a healthy and diseased organ, making all points as simple and practical as possible. We also gave a course of lectures and illustrations on Veterinary obstetrics, noting the phenomena of conception, gestation and parturition; the causes, symptoms and treatment for the different diseases of both dam and offspring incident to the parturient state, and until the young has reached weaning time. In addition we continued instructions in horse judging, handling colts, etc.

Third and Fourth Years. With these classes we continued the subject of horse judging, using for the purpose the horses at our command, and visiting the premises of breeders, importers, and dealers.

Special Dairy Class. To this class we delivered a short course of lectures on the ordinary diseases of dairy cattle, with the causes, symptoms and treatment, both preventive and curative.

Short Course in Stock Judging. This course, which was held in January had a larger number of students than in any previous year. As usual we gave a course of practical scoring and judging of the different breeds

and classes of horses. In this I was ably assisted in all classes by Dr. Standish of Walkerton. As on former occasions, we depended largely upon the kindness of local breeders, importers, and dealers for horses to make up classes, and I wish to take this opportunity of publicly thanking Messrs. Sorby, Aitcheson, McConnell, Hurley, Stewart, Tovell, Bowman, and others who so kindly aided us.

Horse Breeding. Our two Clydesdale mares were bred in the spring of 1906, and both proved in foal, but our best mare was unfortunate enough to abort in January. The other mare produced a good foal. During the spring of 1907, Prof. Day purchased another Clydesdale mare, and she and the other two were bred, and appearance indicate that they are all in foal.

I would like to draw the attention of the Department to our urgent need of a stable for breeding mares and colts. All available space in the horse stable is occupied, and it is absolutely necessary, if breeding operations are to be continued, to provide suitable accommodation.

Diseases and Injuries to Stock.

While we have had cases of the usual diseases and injuries in all classes of stock, I am pleased to be able to state that we have had no fatalities except in newly born animals.

Respectfully submitted,

J. H. REED.

PART IX.

THE PROFESSOR OF DAIRY HUSBANDRY.

To the President of the Ontario Agricultural College:

SIR,—I beg leave to submit my seventeenth annual report of the Dairy department of the College. As intimated in my last report, the Dairy Herd was transferred at the beginning of the present year to the department of Animal Husbandry. This allowed more time for experimental work, and for enlarging the commercial branches of the Dairy department.

Early in the Spring we purchased the plant and goodwill of a small creamery which was owned and operated by Mr. T. P. Carter, Guelph. This gave us more raw material for experimental and teaching purposes. Still our supply is not large enough to meet the wants of the department in furnishing practical instruction in the manufacture of cheese and butter during the College term. This is especially true with reference to milk for cheesemaking, as the farmers about Guelph seem loath to part with their skim-milk. We have paid the current prices for milk fat, and offered in addition, 20 cents per 100 lbs. whole milk in lieu of the skim-milk, if patrons would leave the skim-milk with us. Even at this price we were very short of milk for experimental cheesemaking during the summer, and for practical instruction in cheesemaking during the fall term.

The following table shows the amounts of milk and cream received during the year, the amounts of butter and cheese made, money paid to patrons, and cash receipts from sales of cream, butter and cheese, from December 1st, 1906, to November 30th, 1907:

STATEMENT OF MILK AND CREAM RECEIVED, BUTTER AND CHEESE MADE, AND CASH PAID AND RECEIVED, DECEMBER 1, 1906, TO NOVEMBER 30, 1907.

Month.	Lbs. milk, cream received.		Lbs. milk manufactured into		Lbs. manufactured.		Cash Statement.	
	Milk.	Cream.	Cheese.	Butter.	Cheese.	Butter.	Paid Patrons.	Received.
December, 1906	97,166	3,551	402	88,605	42	5,692	$1,222.54	$1,374.52
January, 1907	78,872	7,484	19,650	56,880	1,970	4,318	1,406.89	1,191 84
February	65,884	7,603	20,750	45,637	2,130	4,175	1,416.16	1,287.65
March	68,180	8,920	20,576	49,345	2,014	4,751	1,458.15	1,797.71
April	29,778	9,901	5,400	24,378	507	3,874	894.12	1,347.66
May	41,993	15,223	13,841	28,152	1,315	5,438	1,429.36	1,384.41
June	56,390	25,139	28,094	28,498	2,799	9,305	1,778 66	1,926.89
July	58.574	32,272	25,140	33,419	2,422	10,827	2,203.48	2,358.24
August	45,718	23,477	17,205	28,216	1,673	8,114	1,612.40	2,067.50
September	30,306	15,672	4,860	25,446	472	5,997	1,224.79	1,749.46
October	22,958	11,054	6,475	16,503	711	4,161	928.62	1,307.34
November	19,114	9,180	5,245	12,709	561	3,256	755.40	927.35
Totals	614,933	169,476	167,638	437,788	16,616	69,908	$16.330.57	$18,720.67

I am under special obligations to my assistants, Messrs. Stratton, Ralph and Taylor, and to the Instructors of the Dairy School. The Chemical and Bacteriological departments have rendered valuable aid, especially during the short courses in Dairying.

Teaching.

There is not much variation from year to year in the number of lectures and amount of practical work given to students. The Dairy lectures and practical work for the regular College students are nearly all given in the Fall term, as our plant and Instructors are fully occupied with special dairy classes from January 2nd, to about the middle of April each year.

The attendance at the special dairy courses was sixty-one during the year. The total number was less than last year but a larger proportion than usual staid during the full term and wrote on the final examinations. In 1907, thirty-four students wrote on the examinations at the end of three months term. In 1906, twenty-nine took the examinations.

The following have applied for Diplomas in Butter and Cheese making during the year.

Name.	Address.	Diploma in
Baxter, J. P.	Mackinac, Man,	Buttermaking.
Fockler, P.	Eganville, Ont.	Buttermaking.
McLean, Alex.	Lorneville, Ont.	Buttermaking.
Reid, Wm.	Camlachie, Ont.	Cheesemaking.

Official Testing of Cows.

During the year we have supervised official, seven and thirty day tests, for sixteen breeders of dairy cattle, comprising altogether 73 cows tested. There are a few breeders whose names are not on the list owing to the fact that for some reason or other the test was not completed, or the results were below the standard set, or the breeders preferred not having the test published, hoping for better results at some future time. The number of those conducting official tests would have been larger during the year had we been able to send supervisors at all times when asked for. We had a number of applications for men to supervise official tests which we were unable to grant, because competent men were not available.

We trust that we may be allowed one man who would give practically his whole time to this work during the winter when the demand for official testers is greatest. During the summer when not engaged in this work, he could be profitably employed in the dairy department assisting in experimental work.

The Canadian Holstein Association very properly acceded to our request that they purchase five travelling Babcock test outfits, and also five spring balances, for conducting official tests. The glassware has been tested at the Chemical Laboratory of our College and marked correct. Two of these outfits have been sent to the Dairy School at Kingston, so that breeders in the Eastern part of the Province may avail themselves of tested Babcock glassware and suitable machines without having to send to Guelph for the same. Sometimes official testers are sent out by the Superintendent

of the Eastern Dairy School. The official reports are sent to us and signed by the head of the Dairy Department of the College before forwarding to the Secretary of the Breeders' Association. This plan reduces the travelling expenses of the Official Tester for Breeders in Eastern Ontario, but the accuracy of the results are vouched for by us, we assuming the risk that the person sent by the Eastern School is competent, on the recommendation of the Superintendent of said Dairy School.

The following is the list of Breeders for whom we have conducted Official Tests between November 11th, 1906 and November 11, 1907.

Name of Breeder.	P. O. Address.	Breed.	No. of cows tested.
H. Bollert	Cassel	Holstein	7
W. W. Brown	Lyn	"	4
John Buckrell	Beaconsfield	"	1
D. Duncan	Don	Jersey	3
A. Dunn	Ingersoll	Holstein	2
P. D. Ede	Oxford Centre	"	3
F. J. Griffin	Burgessville	"	4
M. L. Haley	Springford	"	4
Thos. Hartley	Downsview	"	8
R. F. Hicks	Newtonbrook	"	2
F. C. Pettit & Son	Burgessville	"	1
James Rettie	Norwich	"	3
Geo. Rice	Tilsonburg	"	15
M. Richardson	Caledonia	"	4
W. Rivers	Foldens	"	5
Wm. Slaght	Bealton	"	7

Testing Samples of Milk and Cream.

Since my last report we have tested about 150 samples of milk and cream which have been sent in by various parties by means of mail and express. So far as our time will permit, we are pleased to make these tests to settle disputes at creameries, or to give persons who have no tester, an idea of the percentage of fat in their cream, or fat lost in skim-milk. We frequently receive samples without anything to indicate where or from whom they came. Sometimes we receive several samples at one time from different places, and nothing to indicate by whom the individual samples were shipped. It is impossible for us to report on such samples.

There are a few points requiring attention from the persons sending us samples to test:

1. It is important to send a *representative* sample of the milk or cream to be tested.

2. If a fat determination only is required, about two fluid ounces is sufficient, but the sample bottle must be filled to the top in order to prevent churning. If a specific gravity determination is also required then we need about one pint of milk.

3. The sample must be securely packed so as to prevent breaking during transit.

4. Mail or express charges must be prepaid.

5. All samples must be properly marked and the name and post office address of the shipper must be plainly shown.

6. Charges amounting to five cents per sample for fat determination and twenty-five cents per sample for "total solids" determination should accompany samples sent to be tested.

An Excellent Record.

Last year we reported the "good record" in November, 1906, for the Holstein cow, Boutsje Q. Pietertje De Kol, No. 6093, C.H.F., which dropped a calf on October 26th, 1906. We are very much pleased that this cow maintained her good performance throughout the year. Much credit for her remarkable record belongs to the herdsman, Mr. C. S. Wood. Although the cow was not in the charge of the Dairy department after January 1st, 1907, we take the liberty of requesting that her record for the full year period of lactation be published. We think it is the best year record of performance of any Canadian cow, and it is doubtful if any cow beginning her record before she was four years old, has done more creditably. We think this record of sufficient importance to justify its publication in detail by months, which is as follows:

Boutsje. Record for twelve months, Oct. 27th, 1906, to Oct. 26th, 1907, (inclusive).

Month.	No. of days Milking.	Lbs. Milk.	% fat.	Lbs. fat.	Value of fat.	Value of milk at 4 cts. per qt.	Cost of feed.
Oct. 1906	5	264	3.0	7.92	$1.59	$4.21	$1.40
Nov. "	30	2522	3.5	88.29	19.41	40.32	8.34
Dec. "	31	2352	3.7	87.02	22.62	37.60	7.98
Jan. 1907	31	2105	3.6	75.78	19.70	33.60	7.95
Feb. "	28	1770	4.1	72.57	20.31	28.32	7.00
March "	31	1994	3.8	73.87	20.68	31.09	7.83
April "	30	1755	4.3	75.46	18.86	28.08	7.58
May "	31	1720	4.0	68.80	17.20	27.52	7.83
June "	30	1701	3.8	64.64	12.93	27.20	2.75
July "	31	1437	3.6	51.73	10.34	22.96	3.11
Aug. "	31	1282	3.6	46.15	10.13	20.50	3.11
Sept. "	30	1051	3.8	39.93	9.17	16.80	4.10
Oct. "	26	875	3.4	29.75	7.44	14.00	3.68
	365	20,778	3.76	781.91	$190.38	$332.20	$72.66

Methods of Determining Moisture in Dairy Products.

Last year we discussed in detail a method of determining moisture in dairy products which we considered simple enough to use in creameries and cheeseries. This method consists of drying samples of butter, curd, or cheese in small tin "pattypans" in a steam oven attached to one of the steam pipes in the creamery or cheesery. The plan was fully described and illustrated in our last report.

We have been trying during the past year to simplify the method still further, and find that by having the tin dishes all the same weight and by weighing into the dishes exactly 2.5 grams of the product to be tested, it reduces the amount of weighing and mathematical work considerably. The plan followed was to select the heaviest dish among the lot we were using and bring all the others to the same weight by dropping common solder on the side of the dish until it was approximately the correct weight, which in this case was 30 grams. Then by the use of a file the solder was removed until each dish was exactly 30 grams in weight. The dishes need to be tested from time to time to see that they are correct. When weighing a sample, place the small dish on one pan of the scale and a 30-gram weight on the other; if these balance, then add 2.5 gram weights to the 30. Now put butter, curd, or cheese into the dish until the 32.5 gram weights are balanced. When all

samples are taken according to directions as given in my report of last year, place in the steam oven and dry at a temperature of 100° to 105° C. for about five hours. Then weigh, place in the oven again for about one hour and weigh again. If the weight is constant, all the moisture has been evaporated. The difference between the original and second weight is the amount of moisture lost. This difference multiplied by 40 equals the percentage of moisture lost. For example, dish and sample weigh 32.5 grams at the beginning; when weighed the second time they weigh 31.67 grams. The difference is .83 grams; $.83 \times 40 = 33.2$, which is the percentage of moisture in the sample. The reason that the factor 40 is used for multiplying the difference in weight is that 2.5 is one-fortieth of 100. The most convenient weight of butter, curd, cheese, etc., for a sample has been found to be 2.5 grams; as it is sufficient to be representative, it dries in a comparatively short time, and the factor 40 is a very convenient for finding the percentage of moisture in a sample.

A Short Test for Determining the Moisture in Curd at Dipping.

Last year we gave details of a very simple relative test for the amount of moisture in curds at dipping, or removal of the whey from the curd. Further experiments have been conducted during the past year. Briefly, the plan consists of packing a weighed measure with a given volume of curd. We use a 17.5 cc. measure for convenience. Then weigh the measure and curd. The difference between the weight of the measure and the weight of measure and curd is the weight of curd. As the moisture is removed from the curd, the weight of a given volume decreases. Last year we found that for each decrease in weight of .1 gram in a 17.5 cc. measure the percentage of moisture in the curd decreased about .6 of 1 per cent. During 1907 we found that curds which averaged 52.904 per cent. moisture at dipping averaged 18.309 grams, as the weight of 17.5 cc. curd. When similar curds were stirred so as to average 48.692 per cent. moisture at dipping, the average weight of 17.5 cc. of the curd was 17.487 grams—an average decrease in the curd of one-tenth of a gram in weight of 17.5 cc. This is approximately the same as last year. The difference between the results this year and last is probably accounted for by the difference between the specific gravity of the moisture-free curd. This varies from year to year. Some authorities claim that during a dry season the relative amount of casein in milk is considerably less than in a wet season, and that the yield of cheese is less from similar milk.

Other Short Tests.

During the past year at least two other short moisture tests have been brought prominently before Canadian cheese and buttermakers. One of these was invented by C. E. Gray, of the Department of Agriculture, Dairy Division, Washington, U.S.A. Early in the year, E. H. Webster, Chief of the Dairy Division, Department of Agriculture, Washington, very kindly placed at our disposal two sets of the Gray apparatus for experimental purposes. We take this opportunity of thanking Chief Webster for his courtesy in this matter. Later in the season we purchased the "Improved Gray apparatus" from the Wagner Glass Works, New York, U.S.A.

The Gray method is given in detail in Circular No. 100 from the U. S. Department of Agriculture. Briefly, the method consists in boiling ten grams of butter in a suitable flask, to which has been added 6 cc. of "a mixture amyl-acetate 5 parts, and amyl-valerianate 1 part." After boiling for 5 to 8 minutes the amyl reagent and the moisture are driven into a graduated flask where the percentage of moisture is read. In the ordinary Gray appa-

ratus the measuring flask must be disconnected, and the tube reversed before it can be read. The Wagner improvement consists of a modification, whereby the reading may be done without disconnecting or reversing, which is obviously an improvement so far as the practical operation of the test is concerned.

The other short method is variously known as the "Beaker method," "Richmond," "Patrick," and "Irish." So far as we have been able to look into the matter, the credit for discovering this method belongs to H. Droop Richmond, analyst to the Aylesbury Dairy Company, London, England. The method in its essentials was described in his book, "Dairy Chemistry," published in 1899, and was more fully described in his "Laboratory Book of Dairy Analysis," 1905.

Briefly, the method consists of heating 10 to 20 grams of butter, etc., in a beaker (aluminum preferred), directly over a gas flame or spirit lamp until foaming ceases and the substance has become somewhat brown in appearance, showing that the water has been evaporated. In our work we found ten grams of butter a convenient sized sample to use. The chief weakness of the test is in determining the "end-point," *i.e.*, the point when heating should cease. If heated to the point where the fat is charred, an excessive loss takes place and the percentage of moisture credited is too high. Otherwise, this is undoubtedly the simplest moisture test yet devised. It is quickly made, the results are fairly accurate, there is no cost for chemicals, or glassware easily broken, and no great skill is needed, except for weighing accurately and in knowing when to cease heating.

During the past year we made between 40 and 50 comparative tests in duplicate of the four methods, viz., drying in steam oven, Gray, Gray-Wagner and Richmond short tests. We also made a few comparative tests of the Gray and Richmond methods on curd and cheese, but found these short tests unsatisfactory. The results with curd were altogether too low. It was also found a very difficult task to clean the beakers after heating curd or cheese in them directly over the flame. We abandoned both these short tests for determining the moisture in curd and cheese after a few trials.

The following table shows the comparative daily results of several tests of butter and also the average for the season for the three methods:

Date.	No. of samples tested.	Method of Determining Moisture.			Av. difference compared (with oven).	
		Steam oven Av. % Moist.	Gray Av. % Moist.	Richmond Av. % Moist.	Gray %	Richmond %
April 16	4	14.971	14.500	14.310	—.471	—.661
" 18	2	13.953	13.250	12.785	—.703	—1.168
" 20	3	13.933	13.283	13.891	—.650	—0.042
" 27	4	14.329	13.675	13.437	—.654	—.892
" 30	4	15.204	14.750	14.793	—.454	—.411
May 2	2	17.612	15.700	15.837	—1.912	—1.775
" 7	2	15.040	14.025	14.362	—1.015	—.678
" 14	2	14.939	14.200	14.300	—.739	—.639
" 16	2	16.099	15.287	15.350	—.812	—.749
" 21	3	13.966	12.633	12.933	—1.333	—1.033
" 23	2	15.800	14.151	14.137	—1.650	—1.663
" 28	3	13.466	12.783	12.916	—.683	—.550
" 30	2	14.350	12.625	13.287	—1.725	—1.063
Average of.....	35	14.874	13.912	14.026	—0.962	—0.848

The individual samples of butter in this table varied from 12 to over 19 per cent. moisture, which covers practically all the range there would likely be in ordinary work.

On June 27th and July 2nd six comparative tests were made, including the Wagner Improved Gray method. The results from two samples on June 27th were 14.1 per cent. moisture from the steam oven, 13.85 from the Gray-Wagner, and 15.1 from the Richmond beaker method. This was the only case where either of the short methods gave as high or higher results than did the steam oven. On July 2nd four comparative tests were made in duplicate of the four methods. The results were 15.15 per cent. moisture from the steam oven; 13.912 by the regular Gray; 12.875 by the Gray-Wagner; and 14.537 per cent. by the Richmond beaker method. In these tests of July 2nd the regular Gray method gave us results 1.238 lower, and the Gray-Wagner 2.275 lower than did the steam oven. While the Wagner improvement simplifies the operation of making a test with the Gray apparatus, the results were lower than those got from the regular Gray apparatus. As shown in the foregoing table, the regular Gray apparatus gave results averaging nearly one per cent. lower than did those from the steam oven. The Richmond method also gave lower results than were got by drying in a steam oven at a temperature of 100° to 105° C.

*We think the low results got from the Gray apparatus are due to some extent at least to loss of moisture during the heating process. In the Richmond test, as previously pointed out, the difficulty is to know when all the moisture has been driven off and when charring of the fat and other substances begin.

Conclusions.

1. The steam oven method of determining moisture in dairy products is simple and requires very little actual time to make a test. We understand that one of the American stations has adopted "a High Pressure Oven" method, in which results are got in from one to two hours. We can see no special advantage in this and the extra cost for such an oven, and the extra risk of bursting would probably counterbalance any advantages there may be in lessening the time required to dry the samples. All the other work would be the same for "a high-pressure oven" as for the simple one used by us. However, we hope to test the "high-pressure oven" during 1908.

2. None of the so-called short tests for determining moisture in dairy products has been altogether satisfactory. The one which comes nearest to a practical short test is the Richmond or Beaker method. We have not, however, found this suitable for curd or cheese. Further investigation may overcome the difficulties of this short test.

3. We would again strongly advise butter and cheese makers to become acquainted with the various methods now in use for the determination of moisture in dairy products. By so doing they will eliminate the risk of making butter which may be illegal (containing over 16 per cent. water) and in cheese work it will enable the maker to have more uniformity in the curd and cheese, thus adding to the pleasure and profit of dairying.

*Since the foregoing was written, Prof. Gray has explained that some of the poor results got by using his moisture test are due to improperly made apparatus or to poor reagent. He says: "The first thing of importance is that the glassware should be correctly graduated. Another, the stopper which closes the end of the graduated tube must fit properly, also the rubber stopper which connects this graduated tube with the glass must fit properly. Another thing, the reagent must be made of pure compounds. If they contain impurities, the impurities are soluble in water and may take up water. Impurities may increase or decrease the apparent amount of water. If you have a space between the end of the rubber stopper fitting into the flask and the side of the flask, moisture will be lost."

EXPERIMENTS IN BUTTERMAKING.

Our experimental work in buttermaking during the past year has been along lines similar to those of last year, viz., (1) studying the effects of different methods of treating cream and butter, the latter to be exported to London, England, (2) the effects of different methods of manufacture on the moisture content and keeping quality of butter.

Up to the end of 1906 most of our raw material at the College Creamery for butter-making was supplied in the form of milk. Some cream was delivered during 1906, but this was practically all sweet when we received it.

During 1907 most of our delivery for buttermaking consisted of cream, some of which was delivered three times a week, but most of it only twice a week. The major portion of it was sour when we received it, and in some cases the cream was poor in flavor. These facts will explain some of the adverse criticisms made this year by the English firm who received our experimental shipments in 1906, and again in 1907.

The experimental shipments to London consisted of lots of butter made from cream raw or unpasteurized; lots from sweet and sour cream pasteurized, cooled and churned at once without culture; lots treated similarly to the foregoing except that ten to fifteen per cent. of culture was added to the cream just before churning; and lots made from cream which had been pasteurized and the cream afterwards ripened in the usual way. These six kinds of cream formed the basis of the main series in the experiments. In connection with the major series, there were four minor series of experiments to determine the effects of three different kinds of preservatives and the effect of common salt (sodium chloride) on the quality of butter. The preservatives were applied with and without salt in both dry and liquid form.

We arranged with Messrs. Hodgson Bros. & Rowson, of Montreal, to score the butter on arrival there, then to forward the various lots to London, Eng., where the firm of Rowson, Hodgson & Co., examined the butters, sold them and reported results. We are under obligations to these two firms for their interest in the work and for their patience and goodwill in sending us reports on the various lots.

The same general plan of conducting the experiments was followed in 1907 as in 1906. Details of methods used in making the butter will be found in my last report and need not be repeated here. We arranged with the Grand Trunk Railway to lift the butter weekly from our refrigerator and place it on board the refrigerator car for Montreal. In a few cases shipments were made once in two weeks.

The following correspondence with reference to the refrigerator car service at Guelph explains itself. I may add, that it would seem as if the railway cl rks and hands had decided that after my first visit I should not have another opportunity to closely inspect the refrigerator cars. I may be mistaken, but it certainly looked as if there was some pre-arranged plan whereby observations in future would not be allowed. The first time I went to the freight shed, the clerks in the freight shed and the men on the train afforded me every facility for getting facts, but it was quite apparent on my second and third visits that a new order had gone forth. I am not prepared to say that this came from headquarters, but there was apparently a change of attitude on the part of those concerned. During a call from the Division Freight Agent, G.T.R., and the local agent, their attention was called to

this point, but they denied that any such order or understanding existed and explained it on the ground of carelessness of employees. They also said that wrong information about trains was also due to the same cause. As they expressed it, "The men didn't know where the way freight was, they simply guessed at it." These officials admitted that perishable freight should receive first attention on arrival of freight trains at a station.

Guelph, Canada, Sep. 6th, 1907.

Secretary Railway Commission, Ottawa, Ont.

Dear Sir,—At the request of Dr. Mills, Railway Commissioner, I am enclosing notes taken on three different occasions,— July 20th, July 27th, and August 10th, of the present year,—regarding the G.T.R. refrigerator car service for butter at Guelph. I sent these facts to Mr. Loud, General Traffic Manager of the G.T.R., on Aug. 10th, and had a letter from him saying he would look into the matter, but have heard nothing further. I may say that the service was very similar last year.

I have also requested the two Creamery Instructors for Western Ontario, Messrs. MacRobertson, St. Mary's, and Fred Dean, Strathroy, to send me any reliable information on the subject of refrigerator cars for butter which they may observe in their travels visiting creameries. This information will be forwarded to you as soon as it is received by me.

Trusting that the enclosed facts may be of service in securing an improved refrigerator car service, I am,

Yours respectfully,

H. H. Dean.

Notes *re* Refrigerator Car Service, G.T.R., Guelph, Ont.

July 20th. Refrigerator Car No. 40086, pulled up at the freight shed platform, 10 a.m. Our butter had been in the freight shed at 78°F. since about 9 a.m., having been lifted from our refrigerator at the College about 8 a.m., same day. The temperature of the air outside at the freight shed was 82°F. The temperature in the ordinary box cars on the siding was 80° to 82°. The temperature of the refrigerator car was 72°F. in the West end, 74° near the middle, and 76°F. in the East end, where our butter was placed. As the West end of the car was nearly filled with butter which had been loaded at Baden, this probably accounts for the lower temperature in this end of the car. I got on top of the car while one of the train hands removed the covers from the ice boxes. I found three blocks of ice in each of three ice boxes and two in the other ice box. The total estimated weight of ice in the four ice boxes was between 500 and 600 lbs.

I also noted that owing to the manner in which the refrigerator car doors are constructed, these doors must be open when the car is shunted alongside the platform and they cannot be closed until the car is moved from the platform. On this day, the car was standing for about one-half hour with the hot sun shining directly into the car. The doors were still open and the engine was still shunting in the yard when I left about 10.30 a.m. The temperature in the car in the meantime had risen to 78°F.

July 27th. The "way freight" was reported as likely to arrive in Guelph about 10.15 a.m. At 11 a.m. I was told that she was at Petersburg and would not likely reach Guelph until between 12 and 1 o'clock. After taking observations on the temperature of the freight shed which was 72°F. where our butter was being held to await the arrival of the freight, I went to luncheon. About 12.45 I telephoned to see if the freight had yet arrived. She was reported as in, and likely to remain about 20 minutes. Before I could leave the Dairy, word was sent that the freight was "just pulling out," consequently I was unable to make any observations on the refrigerator car that day.

August 10th. "Way freight" reported as likely to arrive about 10.45 a.m. This train pulled into the Guelph freight yard about 11.45 a.m. Our butter had been taken from our refrigerator about 8 a.m., same day. Temperature of air in sun at Dairy at 10.25 a.m., 86°F.; in shade, 80°F. Temp. 11 a.m., in sun at freight shed 87°F. Temp. of air in freight shed near butter 84°F. By 11.50 a.m.. the temperature in the sun at the freight shed had risen to 90°F. All this time our butter was in the hot freight

shed, while the train hands were busy unloading iron, barrels, etc. from the cars. After asking several times when the refrigerator car would be shunted on the siding for our butter, so that I might make some observations, and after receiving no satisfaction as to when the car would be opened for the butter, I left the yards, as it seemed a waste of time to wait any longer. We discontinued the shipments after August 24th.

The reports which we have received from London, England, regarding the quality of our butter were not at all satisfactory. We had a number of complaints as to poor flavor, but more, that the butter was "greasy." We bored samples before leaving our refrigerator and almost without exception the lots appeared firm in body and texture. We are inclined to think that the "greasy" condition reported by the London firm was due largely to the high temperature at which the butter was carried during transportation. It may have been on the steamship, or after reaching London, but we know that at least a portion of the damage was done in the freight shed and on the car between Guelph and Montreal.

H. H. Dean,

Professor of Dairy Husbandry.

In a letter dated August, 12th, 1907, Freight Traffic Manager, Jno. W. Loud, Montreal, says, "Your complaint through Commissioner Mills in February last was referred to Mr. McGuigan, Fourth Vice-President, and I was in hopes that the service would after that time be quite satisfactory; from your letter, however, there is still room for improvement." Mr. W. G. Brownlee, General Transportation Manager, G.T.R., in a letter dated, Montreal, Sept. 30th, 1907, says, in explanation of matters referred to Mr. Loud, to whom I had written giving facts as stated in the correspondence with the Railway Commission: "The night foreman, who has charge of icing cars, states that there were fully two tons of ice in this car (No. 40086) when it left Stratford, and he thought that it would be sufficient to carry it through." "The information as to the time of arrival of way freight was given by————————who is not now in the service." The foregoing are extracts from a report furnished to Mr. Brownlee by U. E. Gillen, Superintendent at Toronto. From the foregoing it would seem as if the railways were trying to give a satisfactory service, but are largely at the mercy of employees who do not give the business that attention that it ought to receive. The only way to get an improvement in the service is to keep the matter before the railway managers and the public. The firm in Montreal to whom we were sending our butter say, in a letter dated Montreal, June 25th, 1907,— "Your butter arrived yesterday in a more heated condition than it should, and we are of your opinion, that the companies are not giving sufficient attention to the proper icing of cars. . . . . We have had several instances of supposed refrigerator cars, where the butter has actually been shipped without a particle of ice. . . . . We are doing all we can in this respect, but we have to take pretty much what is given us and look pleasant. . . . . As these refrigerator cars receive a bounty of five dollars each from the Government; they should be given proper attention."

One of the Creamery Instructors for the Province reports, "200 to 250 boxes of creamery butter and nearly as many tubs and boxes of dairy were delivered at a station in Western Ontario between 9 and 10 a.m.,and it was still on the station platform at a temperature of 70 degrees when I left at 5 p.m., the way-freight not having arrived."

It is evident from these facts that lack of ice in the cars and delays on account of the way-freight are quite common. As Freight Traffic Manager Loud says, "There is still room for improvement."

TABLE I.—SUMMARY OF THE CHIEF POINTS IN THE MANUFACTURE OF THE EXPERIMENTAL BUTTERS SHIPPED TO LONDON, ENG., 1907.

Group.	No. of experiments	Kind of Butter.	Av. % fat in cream.	Av. temp. cream at churning.	Average minutes churning.	Av. % fat in buttermilk.	Av. No. of revolutions of worker in working.	Av. No. of 56 lb. boxes in group.	Av. price sold for in London.
				F.					Shillings per cwt. (112 lbs.)
1	12	Unpasteurized cream delivered sour..	23.8	54.2°	33.3	.207	15.3	6	102.7
2	8	Pasteurized sour cream	22.5	55.5°	19.6	.650	16	6	102
3	5	Cream chiefly sour when delivered, pasteurized, cooled, culture added and churned at once.....	26.9	49.4°	40.4	.234	15.8	7	101.8
4	5	Cream pasteurized, sweet, cooled, culture added and churned at once	28.7	51.6°	19.4	.200	13.2	3	109.6
5	10	Cream pasteurized, sweet, cooled, and churned at once without culture...	30.9	49.°	21.	.237	14	4	106.4
6	5	Cream pasteurized sweet then ripened in usual way before churning.....	24.8	54.4°	15.4	.398	15.4	5	103.6
		Average of all.....	26.2	52.3°	24.8	.321	14.9	5	104.3

COMMENTS ON FOREGOING TABLE.

1. Experiments made with the raw or unpasteurized cream delivered sour, were conducted between June 11th, and July 17th, hence did not have the benefit of the higher market price which prevailed for butter in some of the other groups. The percentage of fat in the cream at the time of churning varied in the different churnings from 18 to 26 and averaged 23.8, which was about 2½ per cent. less than the average percentage of fat contained in all the groups. The temperature for churning was about two degrees above the average, and the time required for churning was 8½ minutes more than the average. The percentage of fat in the buttermilk was about one tenth of a per cent. less than the average for all the groups. The butter was given about the average number of revolutions in the worker during the working process.

2. The lots in the second group were made from cream delivered sour, which was pasteurized in the afternoon of one day and churned the following morning without any culture (starter) having been added to the cream. These lots churned in less time than the average, and produced the greatest loss of fat in the buttermilk, viz., an average of 0.65 per cent. fat. The average price received for these was .7 of a shilling less, per 112 lbs., than for the previous group, and 2.3 shillings less than the average for all groups.

3. The third group consisted of lots made from cream delivered, partly sweet, but chiefly sour. The cream was heated to 180 degrees to 185 degrees F. then cooled to about 46 degrees F., ten per cent. of culture (starter) was added, and the cream was churned at once to an average temperature of 49.4 degrees F. The time required for churning was the longest in this group of any, averaging about 15½ minutes more than the average of all. The fat lost in the buttermilk was about normal, but the price was about the lowest of any of the groups. This was due to some extent to the fact that the butter was made and shipped during June and July when prices were lowest in London, Eng.

4. In group four, the aim was to have all the cream sweet when pasteur-

ized. The percentage of acid at the time of pasteurizing varied from .25 to .31 and averaged .262 for the group. These lots of cream were heated to 180 to 185 degrees F., then cooled to about 46 degrees F. by running the cream over the mechanical refrigeration cooler. The cream was conducted from the cooler directly into the churn, ten per cent. culture was added and the cream was churned at once. The average churning temperature was about two degrees higher than for the previous group and the average time required for churning was the second shortest of any of the groups, viz., 19.4 minutes. The percentage of fat in the buttermilk was normal,—.2 per cent. The average price was highest of any of the groups, viz., 109.6 shillings per hundred weight To some extent this is due to the butter arriving in London on a stronger market than was the case with some of the other groups. The butter was made between Aug. 12th and 16th.

5. The butter in group five was made between July 22nd, and Aug. 21st. There were ten experiments in this group. The cream was pasteurized sweet and churned at once, after cooling without any culture. The percentage of acid in the cream at the time of pasteurizing varied from .2 to .27 and averaged .225 for the group. The average price was 106.4 shillings per hundred weight.

6. Group six, made between June 20th and Aug. 8th, consisted of five experiments. The cream was pasteurized sweet, culture was added, the cream was ripened in a vat in the usual way and churned next morning. The time for churning was the shortest of any of the groups, averaging 15.4 minutes and the percentage of fat in the buttermilk was above the average, being practically .4 per cent. The average price obtained for the butter in this group was 103.6 shillings. Some of the lots, however, were delivered on a dull market which affected the average price adversely.

TABLE II.—SCORES OF BUTTER AS GIVEN IN MONTREAL AND PERCENTAGES MOISTURE, CURD, SALT AND PRICE SOLD FOR.

Kind of Butter.	Date of making.	Serial No.	Flavor, 50.	Grain, 20.	Color, 15.	Salt, 10.	Package, 5.	Total, 100.	Per cent. moisture.	Per cent. salt.	Per cent. curd.	Price sold in London.
												s.
Unpasteurized cream delivered sour.	June 11	2	48	18	13	10	5	94	.....	....	....	97
½ oz. salt, ¼ per cent. borax in butter.	" 12	3	48	20	15	10	5	98	14.09	1.60	.765	94
	" 18	6	48	18	14	10	5	95	15.20	2.63	.599	98
Group 1.	" 28	11	46	18	15	10	5	94	13.63	1.73	.570	102
	July 3	15	47	19	15	10	5	96	12.67	1.94	.530	100
	" 5	16	48	18	13	10	5	94	14.94	2.90	.699	104
	" 10	20	48	18	13	10	5	94	15.04	2.12	.500	102
	" 12	21	40	16	13	10	5	84	15.90	2.62	.543	106
	" 17	25	45	18	13	10	5	91	16.40	2.00	.535	104
Average 9 expts.	.....	....	46.4	18.1	13.7	10	5	93.3	14.73	2.19	.592	100.8
Pasteurized sour cream.....	June 21	8	48	20	15	10	5	98	17.02	1.73	.590	100
	" 26	9	47	20	15	10	5	97	14.79	2.19	.460	100
½ oz. salt and ¼ per cent. borax in butter.	" 29	12	46	18	14	10	5	93	12.28	1.82	.500	102
	July 2	14	48	20	13	10	5	96	12.00	2.56	.550	100
	" 6	18	44	18	13	10	5	90	14.80	2.50	.524	102
Group 2.	" 9	19	44	18	13	10	5	90	15.90	2.50	.511	102
	" 16	24	42	16	13	10	5	86	14.50	2.25	.419	104
Average 7 expts	.....	....	45.5	18.5	13.7	10	5	92.8	14.47	2.22	.508	101.4

TABLE II.—SCORES OF BUTTER—*Continued.*

Kind of Butter.	Date of making.	Serial No.	Flavor, 50.	Grain, 20.	Color, 15.	Salt, 10.	Package, 5.	Total, 100.	Per cent. moisture.	Per cent. salt.	Per cent. curd.	Price sold in London.
												s.
Unpasteurized cream delivered sour.	July 24	28	48	18	15	10	5	96	14.90	....	.570	108
	" 31	31	46	18	15	10	5	94	15.00	....	.570	110
¼ per cent. borax in butter..	Aug. 7	34	47	17	15	10	5	94	14.70	....	.570	108
Group 3.												
Average 3 expts	.....	....	47	17.6	15	10	5	94.6	14.86	....	.570	108.6
Pasteurized sour cream, ¼ per cent. borax in butter..	July 23	27	48	18	15	10	5	96	15.60	....	.51	196
Group 4.												
Cream chiefly sour, pasteurized and cooled, culture added and churned at once. — Washed in brine	June 10	1	48	20	15	10	5	98	.....	.....	....	102
½ oz. salt,.....	" 12	4	47	20	15	10	5	97	15.33	2.10	.660	100
½ oz. salt, ¼ p. c. borax	" 17	5	45	20	14	10	5	94	14.61	2.10	.490	98
½ oz. salt, ¼ p. c. K. P.....	July 12	22	45	20	13	10	5	93	16.05	1.75	.419	105
½ oz. salt, ¼ p. c. A. P.....	" 15	23	42	19	12	10	5	88	14.97	2.12	.598	104
Group 5.												
Average 5 expts.....	.....	....	45.4	19.8	13.8	10	5	94	15.26	2.02	542	101.8
Pasteur. sweet cream, and culture added before churning. — Washed in brine and borax.....	Aug. 12	36	47	20	14	10	5	96	13.50	0.25	.560	110
Salt ½ oz.....	" 14	37	44	18	13	10	5	90	14.30	1.65	.520	108
Same churning. ¼% borax	" 16	38	46	20	15	10	5	96	14.20	....	.490	110
¼% K. P.	" 16	39	46	20	15	10	5	96	14.10	....	.580	110
¼% A. P.	" 16	40	47	20	15	10	5	97	13.90	....	.660	110
Group 6.												
Average 5 expts.....	.....	....	46	19.6	14.4	10	5	95	14.00	.95	.562	109.6
Cream past., sweet, cooled & churned without culture. — Washed in brine.	July 22	26	46	20	15	10	5	96	13.6	0.63	.450	104
½ oz. salt	" 24	29	48	19	13	10	5	95	14.4	1.50	.390	100
½ oz. salt, ¼ % B..	" 29	30	47	20	13	10	5	95	13.3	1.90	.640	104
½ oz. salt, ¼ % K.P	" 31	32	45	18	13	10	5	91	13.8	1.30	.430	104
½ oz. salt, ¼ % A.P	Aug. 5	33	46	17	12	10	5	90	13.8	1.80	.400	104
Group 7.												
Average 5 expts.	.....	....	46.4	18.8	13.2	10	5	93.4	13.78	1.42	.462	103.2
Past. sweet cream without culture. — Washed B. and B..	Aug. 19	41	43	17	15	10	5	90	14.80	0.20	.63	110
Same churning. ¼ % borax ...	" 21	42	47	18	15	10	5	95	14.10	....	.57	110
¼ % K. P....	" 21	43	47	18	15	10	5	95	14.40	....	.61	110
¼ % A. P.....	" 21	44	47	20	15	10	5	97	14.30	....	.45	110
½ oz. salt	" 21	45	45	18	13	10	5	91	13.10	1.25	.58	108
Group 8.												
Average 5 expts.....	.....	....	45.8	18.2	14.6	10	5	93.6	14.14	.62	.568	109.6

TABLE II.—SCORES OF BUTTER—*Concluded.*

Kind of Butter.	Date of making.	Serial No.	Flavor, 50.	Grain, 20.	Color, 15.	Salt, 10.	Package, 5.	Total, 100.	Per cent. moisture.	Per cent. salt.	Per cent. curd.	Price sold in London.
												s.
Pasteurized cream ripened in usual way. Washed brine	June 20	7	49	18	15	10	5	97	14.46	0.37	.530	102
½ oz. salt	" 27	10	45	19	12	10	5	91	13.08	1.81	.500	102
½ oz. salt, ¼ % B.	July 2	13	49	20	14	10	5	98	11.19	2.31	.540	102
½ oz. salt, ¼ % K.P.	" 6	17	49	19	14	10	5	97	15.30	2.49	.657	106
½ oz. salt, ¼ % A.P.	Aug. 8	35	45	15	13	10	5	88	14.80	1.10	.570	106
Group 9.												
Average 5 expts.	.....	....	47.4	18.2	13.6	10	5	94.2	13.76	1.61	.559	103.6

COMMENTS ON TABLE SHOWING SCORES OF BUTTER, MOISTURE, ETC.

The lots of butter made for the various experimental shipments to London, England, during the past season have been grouped in the foregoing table, into nine groups according to the character of the cream from which the butter was made, and nature of preservative used. A third grouping is made according to the nature of the preservatives used in the butter. It will be convenient to comment on the results in the table according to groups.

1. There were nine lots of butter in the first group made from cream delivered sour during the afternoon of one day and churned without pasteurizing the following morning. The lots were treated with one-half ounce of salt per pound of butter and one-quarter of one per cent. common borax. The butter was made between June 11th and July 17th. The average score for flavor as given in Montreal was 46.4 points out of a possible 50. The grain averaged 18.1 out of a possible 20, and 13.7 out of a possible 15 for color. The average total score was 93.3 out of a possible 100. The average percentages of moisture, salt and curd were respectively 14.73, 2.19 and .592. The prices at which these lots sold in London, Eng., ranged from 94 to 106 shillings per long hundredweight, and averaged 100.8 shillings per cwt. for the group. This is the lowest average selling price for any of the groups but to some extent this is accounted for by the fact that the butter reached London during more or less dulness on the market there. No. 1 in group 5, which was saltless and made from sweet cream the previous day and sent in the same shipment as lot 2, sold for 102 shillings, whereas No. 2 in group 1, which was salt butter, sold for 94 shillings. The flavor of No. 2 was reported as being "not nearly so good as No. 1." This and several other lots were reported as being "greasy." We cannot understand the cause of this "greasy" condition of the butter on so many lots, unless they were overheated during transit.

We examined all the lots before leaving our refrigerator, and they "ironed" all right. In one of their letters the London firm says:—"All the butters which you sent last season ironed beautifully, and showed just a nice amount of grain, whilst retaining smoothness without a suspicion of

oiliness." Methods of manufacture were practically the same in 1907 as in 1906, except that our raw material was mostly cream in 1907 and chiefly milk in 1906.

2. Group 2 consists of seven experiments made between June 21st, and July 16th. The butter was made from cream delivered sour, which was pasteurized one afternoon and churned the following morning. Salt and borax were added to the butter, same as for Group 1. The average Montreal score for flavor was 45.5 out of a possible 50 and 92.8 for the total, out of a possible 100. The average percentages of moisture, salt and curd were similar to those in Group 1. The average selling price in London was 101.4 shillings.

3. This group consists of but three experiments made July 24th, 31st and Aug. 7th. The cream was delivered sour and butter was made without pasteurizing. There was added one-quarter of one per cent. borax, but no salt. Average Montreal score for flavor, 47 and a total score of 94.6. Average selling price, 108.6 shillings, which is the third highest price obtained for any of the nine groups. However, there were not a sufficient number of experiments in this group to test the matter fully.

4. The next group contains but one experiment. This was made from pasteurized sour cream, which was churned after standing over night. To the butter was added one-quarter of one per cent. of borax. The score for flavor was 48, with a total score of 96. Moisture in butter 15.6 per cent., curd .51. Price sold, 106 shillings. The London report on this lot was unfavorable, although the price was good. In one of their letters the London firm says: "Kindly remember that when criticising O.A.C. butters we are looking for the excellent quality and texture which these butters showed last year. They are still good butters, or we should not have been able to make the prices we have for them, but they fall below last year's standard."

5. Five experiments with pasteurized sweet cream to which culture was added and churning done at once, make up this group. One lot of butter was washed in brine and the others are made up of one experiment each, having $\frac{1}{2}$ oz. salt, $\frac{1}{2}$ oz. salt and $\frac{1}{4}$% borax, $\frac{1}{2}$ oz. salt and $\frac{1}{4}$% English preservative (K.P.) and $\frac{1}{2}$ oz. salt and $\frac{1}{4}$% Canadian preservative (A.P.) The average score for flavor was 54.4, total score 94. Selling price 101.8 shillings. The butter was made between June 10th and July 15th. "These had a slightly peculiar flavor and the aroma not so good as lot 21." (Lot 21 was made from unpasteurized cream and shipped at same time as lots 22 and 23 to which foregoing comment from London refers.)

6. Group 6 consisted of five experiments made between Aug. 12th and 16th. These lots were also made from pasteurized sweet cream to which culture was added before churning. They were all shipped at the same time from Guelph (Aug. 24th.) One lot was washed in brine and borax water, one had $\frac{1}{2}$ oz. salt added (No. 37) and the remaining three lots were taken from the same churning. All the lots of saltless butter sold for 110 shillings, while the one lot of salt butter sold for 108—two shillings less than saltless. The London comments on these lots are: "The shipment *ex* "Iona" is a distinct improvement on any we have had this season, and all the butters (with the exception of one box, No. 45, which showed the peculiar flavor observed in other shipments, though not quite so pronounced) were very fine in quality, and almost all of them were very fine in texture. . . . . With the exception of one lot, No. 37, the aroma is still poor, but we suppose we cannot expect from Canadian butters, at least three weeks old, as good an aroma as we get from Danish or Irish, which are only three or four days old, when they reach this market."

Group 7 was treated similarly to Group 5, except that the cream was mostly sweet at the time of pasteurizing and had no culture added before churning. The average selling price was 103.2 shillings. London comments unfavorable.

8. This group was treated similarly to the previous group except that one lot was washed in brine and borax water, and four lots were from the same churning, three of which were treated with different preservatives and one with a half ounce of salt per pound of butter. They were shipped from Guelph at the same time as the lots in Group 6 (Aug. 24th.) It is interesting to note that lot No. 41, scored 43 for flavor in Montreal, lot No. 45, scored 45 and the others 47. The total scores in Montreal were 90, 95, 95, 97 and 91. The lot scoring 90 in Montreal sold for 110 shillings per hundredweight in London. The lot scoring 91, sold for 108 and the others for 110 shillings per long hundredweight. The lots in this group and those in Group 6 averaged the highest prices on London market, viz., 109.6 shillings. To some extent this was due to the butter reaching London on a favorable market.

9. Group 9 consisted of lots made from cream pasteurized, then ripened over night in the usual way with a culture or "starter" added. These lots were made between June 20th and Aug. 8th. One lot was washed in brine, one had ½ oz. salt added and the others were treated with salt and three different kinds of preservatives—Borax, K.P., and A.P. These lots averaged the highest score for flavor in Montreal, except Group 4, which contains but one experiment. The average selling price was 103.6 shillings due to some extent to a dull market on reaching London. Comments from London firm on these lots are: "Flavor good," "Flavor fair." "These were very fine in quality and the best lots as regards texture." "Flavor very clean, aroma poor."

Table III. Shows Average Scores of Salt and Preservative Lots of Butter as given in Montreal, also Average per cent. Moisture in Butter, and Price Sold in London.

Kind of Butter.	Flavor 50.	Grain 20.	Color 15.	Total 100.	% Moisture.	Price in shillings per cwt. (112 lbs.)
Common salt, ½ oz.	45.80	18.80	13.20	92.80	14.022	103.60
¼ % borax	46.88	18.34	14.74	94.98	14.698	107.08
½ oz. salt and ¼ % borax	46.62	19.62	13.67	94.95	13.392	101.35
½ oz. and ¼ % K.P.	46.33	19.00	13.33	93.66	15.050	105.00
½ oz. and ¼ % A.P.	44.33	17.00	12.33	88.66	14.523	104.60
¼ % K.P.	46.00	18.60	14.30	94.00	14.100	108.00
¼ % A.P.	46.66	19.00	14.00	94.60	14.160	104.60
Salt brine	47.66	19.30	15.00	97.00	14.030	102.60
Brine and borax	45.00	18.50	14.50	93.00	14.050	110.00
Average of all	46.142	18.684	13.896	93.738	14.225	105.20

Comments on Foregoing Table.

1. The highest average score for flavor as given by Hodgson Bros. & Rowson of Montreal, was for the lots washed in salt brine. This score (47.66) was 1.5 points above the average score in flavor in all the lots and nearly one point higher than the average for any other group. The next highest average score for flavor was for the lots of butter treated with one-quarter per

cent. of common borax. The lowest average scores for flavor were given to the lots treated with a Canadian preservative (A.P.) and the next lowest were lots washed in brine and borax water. The lots treated with common salt were third lowest in flavor.

2. The lots treated with one half ounce of common salt and one-quarter of one per cent. borax received the highest average score for "grain." This score was about one point above the average for all the groups.

3. In color, the lots washed in salt brine stand first, being a little over one point above the average.

4. The salt brine group also stands first in average total score, making a total of 97 out of 100, which is over three points above the average for all the groups.

5. The English preservative (K.P.) group, contains the highest percentage of moisture, being about three-quarters of a per cent. above the average for all the groups. The extreme variation in moisture in all the groups is less than two per cent.

6. The brine and borax group brought the highest average price in London, viz., 110 shillings. This is accounted for to some extent by the fact that these lots struck a more favorable market. The average price obtained for all the groups was about 105 shillings per long hundredweight.

Financial Returns.

As explained last year, the main object of the experiments was not the money profits, though this is an important factor from a business viewpoint. We give the financial data for the various shipments and also prices at which our butter sold locally for the sake of comparison.

It will be borne in mind that there were extra charges against these small lots which would not occur in the case of sending forward larger shipments.

Table IV.

Date of shipment from Guelph.	No. 56 lb. boxes in shipment.	Weight of butter.	No. of experiments in shipment.	Price at which butter sold in London per 112 lbs.	Net value of shipment.	Net value per lb. butter.	Price per lb. butter on local markets.
		Lbs.		Shillings.	$ c.	c.	c.
June 15.....	23	1,288	4	94 to 102	237 50	18.5	22
" 22.....	26	1,456	4	98 to 102	269 14	18.5	22
July 6.....	40	2,240	6	100 to 102	421 60	18.5	22
" 13.....	32	1,792	5	102 to 106	346 25	19.3	22
" 20.....	32	1,792	5	104 to 106	341 05	19.0	22
" 27.....	23	1,288	4	100 to 108	251 52	19.5	22
Aug. 10.....	32	1,792	6	104 to 110	353 70	19.7	23
" 24.....	22	1,232	10	108 to 110	253 45	20.6	24

Conclusions.

1. According to the results obtained in these experiments the advisability of pasteurizing sour cream for export butter would appear doubtful. The loss of fat in the buttermilk by churning pasteurized sour cream was excessive. The average score for flavor was within one-tenth of a point of the lowest average score of any of the groups in flavor. This pasteurized sour cream group was lowest in average total score. The average selling

price in London was second lowest of any of the groups. These remarks apply to pasteurized sour cream churned the day after pasteurization and also to those lots pasteurized sour, and churned at once with and without culture added to the cream before churning. There are a few exceptions to the foregoing general conclusions, notably the lots made June 21st and 26th, July 2nd and 3rd, from pasteurized sour cream.

2. The lots made from cream, partly sweet and partly sour when pasteurized, ripened in the usual way and churned the following day, received the highest average score for flavor in Montreal, but the average total score was less than for the lots made from sweet cream, pasteurized, cooled, and having culture added before being churned at once after cooling. These results agree with those obtained last year.

3. The lots made from cream delivered sour and churned the following day without pasteurizing and having one-quarter of one per cent. borax added to the butter, stand third in average score for flavor and second in average total score. This group also stands third in average price received in London, being but one shilling less per long hundredweight than the average price of the two highest groups, which sold for 109.6 shillings. It would seem from these experiments, though others are needed to confirm the results, that butter made from cream of good flavor delivered sour and having no salt added is nearly equal in quality to the lots made from pasteurized sweet cream. This is somewhat different from our previous experience and we shall require further data before arriving at definite conclusions on the point.

4. Saltless butter appears to suit the London market better than salted butter. In Group 8, table 2, are four lots (Nos. 42, 43, 44 and 45) out of the same churning. No. 45 was salted at the rate of one-half ounce per pound of butter. It scored 45 points for flavor in Montreal and sold for 108 shillings in London. The other lots from the same churning scored 47 for flavor in Montreal and sold for 110 shillings in London. The London firm estimated saltless butter to be worth about two shillings per long hundredweight (112 lbs.) more than salt butter for London, Eng.

5. The results with three different kinds of preservatives, combined with, and without salt, and applied in dry and liquid form to the butter, were similar to those got last year, viz., there was not much difference between the quality of the butter in which common borax was used at the rate of one-quarter of one per cent., and butter having the more expensive commercial preservatives. In the case of the Canadian preservative (A.P.) combined with salt, the Montreal scores were decidedly lower than for any of the other groups. This *might* be due to a combination of other circumstances as we find these lots selling for within six-tenths of a shilling of the average price received in London for all the lots, and above the average price obtained for three other groups. The lots made by washing the butter in a solution of salt (brine) and borax sold for the highest average price in London, although the average Montreal score on these lots is third lowest of any. We also have the peculiar combination of the lots averaging the highest total score in Montreal, selling for the second lowest average price in London. It would seem to be difficult to secure an agreement between scores and price. To some extent this is due to fluctuations in the butter market.

6. Two lots of butter, out of the 44 lots analysed, contained over sixteen per cent. moisture, but the majority averaged between fourteen and fifteen per cent. With ordinary methods of making butter there would appear to be little danger of exceeding the 16 per cent. moisture limit set by Canadian and British statutes.

7. As in 1906, the financial returns from butter shipped to London, Eng., were not equal to those obtained for similar butter on local markets. During the past two seasons Canadian markets have been better than those of Great Britain, and it is possible that in our rapidly developing country we shall be able in the near future to consume all the butter we can produce—in fact we may have to import butter to supply our own needs.

(Since the foregoing was written, considerable butter has been imported from England for local markets in Canada.)

Effect of Different Methods of Increasing the Moisture Content of Butter, Compared with the Moisture Content in Regular Make.

This is a continuation of the work done on this question during two previous years, 1905 and 1906. In 1907 the methods followed may be conveniently grouped under ten different headings—regular method with wash water at a temperature above 60° F., and the same with temperature of wash water below 60° F.; overchurning in buttermilk with temperature of the wash water above 60° and below 60°; butter washed with rollers of worker in motion, temperature of wash water above 60° and below 60°; butter overchurned in wash water at a temperature above and below 60°; butter overchurned in a solution of common salt (brine); and ordinary or regular method.

The experiments were made during the months of April and May. There were 42 different churnings made with these different methods. In addition, ten churnings were made to see if a uniform, fairly high moisture content could be made in butter, in successive churnings on the same day out of the same vat of cream, and also on consecutive days by following the same method. Altogether 52 experiments were made on the moisture question.

Most of the churnings were made for these experiments in a "Simplex" combined churn. A few were made in a "Success" combined churn. The main points of the experiments are brought out in the table, which gives the average results of a number of churnings in each group. The "overrun" is calculated on the pounds of fat in the cream vat, and not on the fat in the milk or cream delivered by the patrons.

Comments on Table V.

1. When following regular methods of buttermaking, except in the temperature of the wash water, the percentage of moisture in the butter varied from 13.8 to 14.597, while the "overrun" varied from 17.69 to 20.85, where the wash water was put on the butter at 62° F. In those experiments where the temperature of the wash water was applied to the butter at an average of 55°, the overrun was 16.62 per cent. and the moisture content of the butter was 13.919 per cent. The average percentage of moisture in the butter was practically the same for both groups, but the average overrun was over 2 per cent. greater for the lots washed with water above 60° F.

2. In those experiments where the butter was churned to lumps in the buttermilk and afterwards washed in water at a temperature above 60° F. the average percentage moisture content of the butter and per cent. of overrun were respectively 13.604 and 19.13. Lots treated similarly, except that the wash water was below 60° in temperature, averaged 14.536 and 17.72 per cent. for moisture content and overrun, respectively. Again we have a high overrun associated with a comparatively low percentage of moisture.

TABLE V.—Showing effects of Methods of Churning on Moisture Content of Butter.

Method of Churning.	No. of experiments.	Average lbs. cream churned	Average % fat in cream.	Average temp. of cream at churning.	Average min. churning.	Average temp. of buttermilk.	Average % fat in buttermilk.	Average temp. wash water.		Average No. of revolutions of worker.	Average lbs. fat in each churning.	Average lbs. butter in each churning.	Average % over-run.	Average % moisture in butter.
								On.	Off.					
Regular — Wash water above 60°	5	254.6	25.7	55° F.	25.8	56.8° F.	.126	62° F.	61° F.	13.2	65.46	77.75	18.83	14.109
Regular — Wash water below 60°	9	495.8	25.6	54.6°	21.6	56.6°	.161	55°	55.6°	14.0	128.85	150.72	16.62	13.919
Regular — Average of both	14	409.7	25.66	54.7°	23.1	56.7°	.148	57.5°	57.5°	13.7	106.21	124.66	17.41	13.987
Overchurning in buttermilk — Wash water above 60°	3	260	25.6	54.6°	32	57.3°	.106	62°	61°	13.3	66.73	79.50	19.13	13.604
Overchurning in buttermilk — Wash water below 60°	5	481.6	25.6	55.4°	25.4	57.6°	.136	56°	56.6°	14	125.29	144.25	17.72	14.536
Overchurning in buttermilk — Average of both	8	398.5	25.6	55.1°	27.8	57.5°	.125	58.2°	58.2°	13.75	103.33	122.47	18.25	14.187
Washed with rollers in motion — Wash water above 60°	3	261	25.6	55°	27	57°	.106	62°	61°	13.3	66.73	81.25	21.76	16.039
Washed with rollers in motion — Wash water below 60°	3	267.6	25	56.6°	22	58.3°	.156	56°	57.6°	14	66.98	80.33	20.15	16.258
Washed with rollers in motion — Average of both	6	263.8	25.3	55.8°	24.5	57.6°	.131	59°	59.1°	13.6	66.85	80.79	20.96	16.148
Overchurning in wash water — Wash water above 60°	3	245	25.8°	55.6°	20.6	57.3°	.12	62°	61°	13.3	63.34	76.58	21.07	15.004
Overchurning in wash water — Wash water below 60°	15	369.75	26.32	54°	22.15	55.8°	.229	53.4°	55°	14.25	97.14	115.86	18.72	15.016
Overchurning in wash water — Average of both	18	307.37	26.06	54.8°	21.375	56.55°	.174	57.7°	58°	13.77	80.24	96.22	19.895	15.010
Overchurning in brine	3	267.66	25.41	53.6°	20.3	55.3°	.150	57.3°	57.6°	12.3	67.86	83.83	23.49	17.864
Regular—cream same as preceding group	3	267.66	25.41	53.6°	22.3	55.6°	.15	57.3°	57.3°	13.6	67.86	80.00	17.83	14.477

3. Washing with rollers in motion produced a comparatively high overrun and butter with high mosture content. There was not much dfference in the results by washing butter in water above or below 60° F., what difference there is being in favor of a higher overrun at the warmer temperature, but the average moisture content of the butter is slightly lower than for the lots washed in water below 60°.

4. The results of churning the butter into lumps in the wash water were to produce a high overrun (21.07 per cent.) when the water was at an average of 62° as applied to the butter, but the average moisture content of three lots of this butter was 15.004, while five lots treated similarly averaged 15.772 per cent. moisture in the butter and 19.78 per cent. overrun. The average of fifteen experiments was 15.016 per cent. moisture in the butter and 18.72 per cent. overrun. In these groups also, we do not find an agreement between overrun and moisture content of the butter.

5. On April 25th and May 2nd and 16th, the cream on hand was divided each day into two lots. One lot of butter was overchurned in brine and the other was treated according to our regular methods of churning. The brine was made by dissolving common salt in water. In two of the experiments 30 lbs. of salt (10 lbs. for first and 20 lbs. for second washing) was added to the wash water for each churning, then the butter was given about ten revolutions for the first washing and 550 revolutions for the second washing in the churn. This method produced the greatest overrun of any method tried, viz., 23.49 per cent., and the butter contained the highest average percentage of water, viz., 17.864 for the three lots. The individual lots varied from 15.8 to 19.649 per cent. water.

The object of the foregoing experiments was to see how much water could be incorporated with the butter. The method is not recommended, as it produced butter containing more than the legal standard of moisture.

The lots treated in the ordinary way ranged from 13.8 to 15.576 per cent. moisture in the butter, while the overrun varied from 16.78 to 19.67 per cent.

Experiments to Ascertain if Uniform Moisture Content of Butter is Practicable by Following One Method.

In the forty-two churnings, made previously, the percentage of moisture in the butter from individual churnings varied from 12.752 to 19.649. Twenty-four churnings were between 13 and 15 per cent.; one was below 13, eight were over 15 and under 16 per cent., and nine lots of butter contained over 16 per cent. moisture. In ten churnings where one method was followed, viz., churning in the wash water which was at an average temperature of 52° F., when applied to the butter and 53.4° when drawn from the butter, the range in the percentage of moisture in the butter was from 13.2 to 16.4, while the average of the ten churnings was 14.26 per cent. of water in the butter. This range of 3.2 per cent. is rather more than is allowed by some authorities, who claim that butter ought not to vary more than one per cent. moisture in daily churnings. In this series of experiments (10 churnings) eight churnings were within the range of 13 to 15 per cent. moisture in the butter, which would seem to be fairly good work, though it may be possible to get within the one per cent. limit of variation.

Influence of Kind of Churn on per cent. Moisture in Butter.

In each of three groups we have churnings made with the small "Simplex" combined churn and also with the "Success," a similar make of churn,

but one with a larger capacity. These churnings were made on dates close together and with similar cream. The results are as follows:

Churn.	Per cent. Moisture in Butter.	Per cent. Moisture in Butter.	Per cent. Moisture in Butter.
Simplex	14.052	14.292	15.772
Success	13.788	14.904	15.821

The average of ten "Simplex" churnings was 14.705 per cent. moisture in the butter, and for six "Success" churnings the average moisture content of the butter was 14.837, or practically the same. So far as these results go they indicate very litle difference in the moisture content of the butter made in these two styles of churns.

Influence of per cent. Fat in Cream on Moisture Content of Butter.

In the fifty-two churnings the percentage of fat in the cream churned varied from 23.5 to 29. There were nine churnings in which the percentage of fat in the cream was below 25. There were forty-three churnings where the percentage of fat in the cream was 25 per cent. and above. The average percentage of moisture in the butter from the nine churnings where the fat in the cream at the time of churning was below 25 per cent., was 15.22. The average percentage of moisture in the butter of the other 43 churnings was 14.748, or about one-half per cent. less than from the thinner cream. Further experiments are needed before drawing definite conclusions, but the foregoing results do not seem to indicate any marked effect of the percentage of fat in the cream at the time of churning, on the percentage of moisture in the butter.

Effect of Size of Churning on per cent. Moisture in Butter.

In the group where the regular method of churning was followed and the butter was washed in water at a temperature averaging 55°, there were five churnings with the small "Simplex" churn where the size of each churning averaged 77.1 lbs. The average percentage of moisture in the butter from these was 13.992. In the same group were four churnings with the "Success" churn which averaged 242.75 lbs. butter each. The average percentage of moisture in the butter from these four churnings was 13.751.

In the group where overchurning in the buttermilk was done and the butter afterwards washed in water at 56°, there were three churnings (Simplex) which averaged 78.41 lbs. butter each. The moisture content of the butter was 14.292 per cent. In two churnings (Success) of the same group where the size of each churning averaged 258 lbs., the butter contained an average of 14.904 per cent.

In the group where overchurning in the wash water below 60° was followed, were three churnings (Simplex) averaging 79.91 lbs. butter each. The butter contained 15.772 per cent. water. Two churnings (Success) in the same group averaging 242.5 lbs. butter each, averaged 15.821 per cent. moisture in the butter.

In three different methods of churning we have the small churnings averaging the highest moisture content in the butter once, the larger churnings the highest once, and in one group they are practically the same for the larger and small churnings. So far as these experiments go, they seem to indicate that size of churning does not have a constant effect on the moisture

content of the butter. Further experiments are needed before stating definite conclusions.

Quality of the Butter in Moisture Experiments.

All the samples of butter were judged three times—once when about one week old, once when about a month old, and for a third time from two to four months after being made. All samples scored were pound prints wrapped in parchment butter paper, which prints were kept in our ice cold storage at a temperature of about 40° F. No special precautions were taken to preserve the samples other than keeping them in the cold storage. The scale of points used was: Flavor, 50; grain, 20; color, 15; salt, 10; package, 5; total, 100. Except in a few cases of the lots being gritty, all the samples were given full score for salt and package, hence, these need not be considered in the scoring results. We shall give the average of all individual scores in each group and also the average of first, second and third scores for flavor in order to show the deterioration through age. All samples were scored by number and the method of manufacture was not known to the judge at the time of scoring.

Table Showing Quality of Butter by Different Methohs of Manufacture in Order to Increase Moisture in Butter.

Method of Making Butter.	Av. Flavor 50			Av. of All.	Av. Grain 20	Av. Color 15	Remarks.
	1st.	2nd.	3rd.				
Regular, Wash Water above 60° F.	46.6	42.4	41.	43.2	19.9	14.3	Granules size of wheat, peas and corn when buttermilk drawn. Butter given about 150 revolutions of churn in wash water.
Regular, Wash Water below 60° F.	45.6	42.	41.6	43.1	19.8	14.2	Butter granules size of wheat, peas and corn. About 150 rev. in wash water.
Average of both.....	46.1	42.2	41.3	43.15	19.85	14.25	
Overchurning in Buttermilk—							
W. Water above 60°..	47.	42.3	40.6	43.3	19.9	14.16	Butter churned to size of hickory and butter nuts in buttermilk.
" " below 60°..	45.6	42.	41.2	42.6	19.7	13.8	
Av. of both.....	46.3	42.15	40.9	42.95	19.8	13.98	
Washed with rollers in motion—							
W. Water above 60°..	47.	43.3	40.6	43.3	19.77	14.	Butter given about 65 revolutions of churn with rollers in motion. One lot of butter "gritty".
" " below 60°..	46.3	41.3	41.3	43.	19.66	13.3	
Av. of both.....	46.65	42.15	40.95	43.15	19.71	13.65	
Overchurning in wash water—							
W. Water above 60°..	47.	42.3	40.6	43.3	19.83	14.05	Butter size of wheat, peas and corn when buttermilk drawn. Given 150 to 200 rev. of churn in wash water. Butter massed.
" " below 60°..	45.	42.2	41.6	42.6	19.2	14.00	
Av. of both.....	46.	42.25	41.1	42.95	19.51	14.025	
Overchurning in brine	44.	42.3	42.6	42.9	18.	14.5	Butter given 150 to 550 rev. of churn in brine. One lot allowed to stand in brine 15 min. Two lots overchurned in brine by dissolving 10 lbs. salt in 100 lbs. water for 1st brine and given 10 revs. of churn; 2nd brine, 20 lbs. salt in 80 to 85 lbs. water, 550 rev. of churn. Two lots in this group scored half point down for salt.
Regular, Cream same as preceding group	45.	41.	41.	42.3	19.8	14.4	

Conclusions.

1. There was not a constant relation between moisture in the butter and the "overrun" in the various experiments. Sometimes there would be a comparatively high moisture content in the butter combined with a somewhat low "overrun" and *vice versa*. This is a point which we are not able to satisfactorily explain at present. These results are similar to those obtained last year.

2. Overchurning in the buttermilk, massing the butter in the wash water or in brine, and washing butter with the rollers in motion, especially when the butter is soft from using a wash water rather warm, tend to produce a butter with a high moisture content, but in order to be effective these abnormal methods have to be carried to a point where the tendency is to produce a greasy, gritty, mottled butter.

3. The flavor of the butter does not appear to have been affected very much by the various methods adopted.

4. We may repeat what we said last year on this question: "We should consider there is risk in following any of these plans recommended for increasing the "overrun." A buttermaker should aim to make the *finest quality of butter* rather than to see how large an "overrun" can be obtained." We would add, there is also a danger of overstepping the 16 per cent. moisture limit set by law, if these abnormal methods are followed.

EXPERIMENTS IN CHEESEMAKING.

Pasteurization of Milk for Cheesemaking.

It is doubtful if the pasteurization of milk for cheesemaking will ever become practicable in Canada for handling large quantities of milk. The labor and expenses of heating and cooling from 10,000 to 30,000 lbs. milk daily would be very great—in fact almost prohibitive. In European countries, we understand that the pasteurization of milk for cheesemaking is frequently practised.

In previous experiments on this question we found it necessary to add a soluble lime salt, such as calcium chloride, to pasteurized milk before the rennet would coagulate the milk properly. Even then, the coagulum or curd was of a flocculent, weak nature and the cheese tended to be soft and porous.

This year, a rather heavy (1½ to 3%) lactic acid culture (starter) was added to the pasteurized milk some time before putting the usual quantity of rennet into the vat of milk. The results were very similar to those obtained by the addition of a soluble lime salt. The rennet coagulated the milk, but the curd was weak in body.

There were five experiments made, one each month, during the season. Altogether there were used 2,980 lbs. milk testing an average of 3.5 per cent. fat. The milk was first mixed together for each experiment, then divided into two equal parts. One part was heated to 180° F. in a milk pasteurizer, then it was cooled, culture was added, then rennet, and afterwards handled along lines similar to those followed in ordinary Canadian Cheddar Cheesemaking. The other part was made into cheese in the usual way.

The average percentage of fat in the whey from the pasteurized milk was .35 and from the normal milk .25. The pasteurized milk produced an average of 106.8 lbs. cheese per 1,000 lbs. milk. The yield from the normal lots was 92.4 lbs. cheese per 1,000 lbs. milk. This was an increase of nearly 14½ lbs. cheese per 1,000 lbs. milk in favor of the pasteurizing.

The cheese made from the pasteurized milk shrank 4.5 per cent. in one month while the normal lots shrank 3.7 per cent. in the same time. The average score of the cheese made from pasteurized milk was 88 out of a possible 100, while the normal lots scored an average of 89.79. The chief difference in quality was in closeness and texture. The cheese made from the pasteurized milk tended to be open and weak in body and texture. The cheese made from the pasteurized milk might suit local markets where a soft cheese is wanted, but would not suit the requirements of the export trade. On the whole, the results were not very satisfactory and we shall require more light on the subject of making pasteurized milk into cheese, before we could recommend the method to Canadian cheesemakers. The striking point in the experiments was the very marked increased in yield of cheese from the pasteurized milk.

Recovering More of the Milk Solids in Cheesemaking.

Milk contains about twelve and one-half per cent. of solids. In the ordinary process of cheesemaking about one-half these solids are recovered and one-half is lost in the whey. Thousands of dollars worth of the most valuable human food material ever prepared by nature or in any laboratory, are annually wasted in Canada, or this human food is fed to hogs after partially decomposing in whey tanks. Owing to the exceedingly high price of butter some of our cheese factories are reviving the method of making butter from the fat in whey, thus recovering the most of the milk-fat which is ordinarily lost in making cheese.

With a view to discovering some means whereby a greater proportion of the milk solids than is now got from milk could be recovered, we conducted some experiments during the past year, to see if we could not reduce the loss of solid material in the whey. From time immemorial, rennet, the active principle usually obtained from the stomach of calves, has been used for coagulating milk for cheesemaking. Rennet acts only on the casein of milk, causing it to curdle or coagulate and at the same time it (the casein) holds mechanically the greater portion of the fat and to some extent the other solids not fat of the milk. Most of the solids not fat, other than casein, pass into the whey or liquid part. To recover all, or a portion of these, was the task set ourselves. We are free to confess at the outset, that we were disappointed in our results, but not discouraged. It is not necessary at this stage to name the agents which we used in our work, which was only preliminary for the present year. Four experiments were made in August, using for the work 2,364 lbs. milk, testing an average of 3.7 per cent. fat. In each experiment the milk was first mixed in a vat, then divided by weight into two equal parts and placed in two separate vats. One vat was coagulated with rennet in the usual way and the curd was treated as in the regular process of cheesemaking. The other vat was coagulated with an agent we shall call, R A2, for convenient reference. The average percentage of fat in the whey from the vats coagulated with rennet was, .24, and in the whey from vats coagulated with R A2 was,

.25, or practically the same as from the rennet lots. Both lots were handled quite similarly at all stages of making except the difference in the coagulating agent.

Previous to making the vat experiments in the cheese department of the dairy, small laboratory tests were made to compare the R A2 coagulating agent with rennet, but nothing special developed in these laboratory tests except that the coagulum (curd) did not appear quite so smooth from the R A2, as from rennet.

The first comparative vat tests were made August 1st, in two vats of milk holding 300 lbs. milk each. The milk apparently contained but 11.6 per cent. total solids, which is very low. The whey, at the time of dipping from the vat in which rennet was used, contained 7.2 per cent. solids, while the whey from the R A2 vat contained 6.8 per cent. solids. These results from the whey seem somewhat high, i.e., there was apparently too great a percentage of solids in the whey. The yield of green cheese from the vat coagulated with rennet was 28.31 lbs. and from the vat coagulated with R A2, was 28.06. The weights of ripened cheese were respectively, 27.31 and 27.13. In both cases there was a slight difference of yield in favor of the vat coagulated with rennet. The percentages of moisture in the curds at dipping and in the green cheese, for the rennet, and R A2 vats were 48.4 and 46.8, 34.8 and 34.4, respectively.

This experiment was repeated on August 2nd. The whey from the vat of milk coagulated with rennet contained 5.8 per cent. solids while the whey from the R A2 vat contained 4.8 per cent. solids. The percentages of moisture at dipping and in the green cheese were respectively, 52.8 and 46.4, 35.2 and 34.5 for the rennet and R A2 lots. The weights of green cheese and cheese at the end of one month were 31.43 and 31.50, 30.43 and 30.50, respectively, from the rennet and R A2 coagulating agents. In this trial the results were in favor of the new agent for coagulating, but it was not very decisive, except that the solids in the whey were one per cent. less by using the R A2, as compared with rennet.

We were unable to continue the laboratory work any further at this point, but two other tests were made in the cheese room on August 16th and 17th. In these tests, the relative weights of green cheese were 28.81 and 29.06 lbs. on the 16th. The weights of cheese at the end of one month were 27.75 and 27.94. The larger yields were obtained by using the new agent. On the 17th, the yield of green cheese was the same from both coagulating agents. The weights of ripened cheese were 26.25 and 26.19—a slight difference in the weight of the cheese at the end of one month in favor of the lot coagulated with rennet.

The average yield of the four experiments was 94.5 lbs. cheese, one month old, per 1,000 lbs. milk for each of the agents. The total weight of ripe cheese from the vats coagulated with rennet was 111.74 lbs. and from the vats coagulated with R A2, 111.76 lbs. The cheese made on August 1st, and 2nd, were ripened in mechanical cold storage, and those of August 16th, and 17th, were ripened in our ice cold storage.

The average percentages of acid were: at the time of dipping .182 for both lots; .725 and .75 at milling; and .91 and .921 at salting, respectively for the rennet and R A2 agents.

There was not much difference in the quality of the cheese, what there was being in favor of those made with the new coagulating agent.

The table shows the average scores of the cheese in the four experiments.

Coagulating Agent.	Flavor 40	Closeness 15	Even Color 15	Texture 20	Total 100
Rennet	37	13.25	14.12	17.75	92.1
R A2	37	13.5	14.1	17.87	92.5

It would be unwise at this stage to attempt to draw any conclusions. The results have been less promising than we had hoped for. However, we shall continue the investigations next year with similar or other coagulating agents, in the hope of discovering some agent which will more or less completely precipitate the milk solids in a palatable, digestible and marketable form as human food.

Amount of Milk Solids Lost in Making Overripe Milk into Cheese.

In conjunction with the Chemical department of the College, a series of tests was planned to ascertain the extra loss of milk solids by allowing milk to become "overripe" or partly sour before making it into cheese. Considerable difficulty was experienced in conducting these experiments. If we selected milk which had been allowed to become overripe by the patrons, we should not have a proper basis of comparison with normal milk, as the lots might differ considerably in other respects. If we mixed the milk together and allowed one-half to stand for some time before commencing to manufacture it into cheese, the objection might be raised that this is not a natural method. We tried both plans, but our results were not altogether satisfactory, and we should prefer withholding the data on these experiments until we have a further opportunity to verify our results. The results got this year are so different from what has been commonly accepted that we hesitate to publish them until we are able to conduct further tests.

Methods of Cutting Curd from Overripe Milk Compared.

A certain amount of milk is delivered at cheeseries in a more or less overripe condition, i.e., it has too much lactic acid, or is too sour, in order to make the finest quality of cheese. If the milk be altogether too ripe and wholly unfit for cheesemaking, the cheesemaker usually returns it to the patron. However, there is always a certain proportion of the milk, especially on Mondays during very hot spells, which the cheesemaker tries to handle in the best manner possible so as to avoid returning it to the patron, as this nearly always causes trouble. Various cheesemakers have various methods of handling such milk. Cutting the curd finer than usual is a standard practice among most cheesemakers. Some, keep a special curd knife for what are known as "fast-working curds." This knife usually has the blades or wires closer together than is the case with the ordinary knife. In the ordinary curd knife, the blades, or wires, are usually one-half inch apart, thus cutting the curd into what are known as "half-inch-cubes." The modern tendency is to discard the steel blades in the perpendicular knife and substitute fine wires strung on a suitable steel frame. The tendency is also towards having both the wires and steel blades $\frac{3}{8}$ of an inch apart, rather than half an inch.

Last winter we had a perpendicular curd knife made of fine wire and having the wires one-quarter of an inch apart, to use in "fast-working curds." The object of the experiments here noted was to compare results got with this special knife, with those got from using the knife having wires $\frac{3}{8}$ inch apart and cutting the curd five to seven times. Altogether there were fifteen expriments made, comparing the $\frac{1}{4}$ inch fine wire perpendicular curd knife and cutting twice only, with the ordinary $\frac{3}{8}$ inch perpendicular curd knife and cutting five to seven times. Both lots were cut once only with $\frac{3}{8}$-inch horizontal blade knife. For this work were used 13,714 lbs. milk testing an average of 3.8 per cent. fat. The average length of time during which the curds from the vats cut with the $\frac{1}{4}$ inch knife "stayed in the whey" was one hour and fifty minutes. The vats cut five to seven times, with the $\frac{3}{8}$ inch knife remained in the whey an average of one hour and fifty-three minutes. The whey from the lots cut with the fine knife ($\frac{1}{4}$ inch) tested an average of .26 per cent. fat, while the lots cut with the $\frac{3}{8}$ inch knife tested an average of .39 per cent. fat—a difference of .13 in favor of cutting with the fine knife.

The percentages of acid at dipping were .198 for both lots. At milling, the average percentages of acid were .724 and .693 and at salting 1.01 and .972 respectively for the lots cut with the fine, and $\frac{3}{8}$ inch knife.

The yields of cheese and percentages of shrinkage are shown in the following table:

Kind of Cheese.	Where Ripened.	Weight Cheese.		Percentage. Shrinkage.
		Green.	Ripe.	
		Lbs.	Lbs.	
A. Curd cut with fine knife..	Mechanical Cold Storage.....	216.19	209.62	3.07
B. Curd cut with ordinary knife.....	Mechanical Cold Storage.....	213.38	207.06	2.90
A.	Ice Cold Storage.....	488.98	478.82	2.07
B.	Ice Cold Storage.....	486.13	475.39	2.02

It will be noticed in the foregoing table that the yields of both green and ripened cheese were greater in both mechanical and ice cold storage by using the fine wire knife for cutting the curds. The shrinkage during one month was also slightly greater in those lots where the fine knife was used.

There appears to be little difference in the quality of the cheese from the two methods as indicated by the scoring. The average total scores of the cheese made by using the $\frac{1}{4}$ inch knife were, 91.9, and 91.58 respectively for the lots ripened in mechanical and ice cold storage. The lots made by cutting the curds with the ordinary knife scored 92.1 and 91.45 in the two storages.

Conclusions.

For fast working milk, a knife made of fine wire (30 gauge) and having the wires $\frac{1}{4}$ inch apart is evidently an improvement over the regular form of curd knife. The advantages are, less loss of fat in the whey and an increased yield of cheese, amounting in these experiments to nearly one pound cured cheese per 1,000 lbs. milk.

A Wire Curd Knife *vs.* Steel Blade Curd Knife.

In order to compare the results from using a perpendicular blade curd knife, having the blades ⅜ of an inch apart, with a wire curd knife having the wires the same distance apart, twenty-two experiments were made on normal milk. Altogether there were used 17,460 lbs. milk testing an average of 3.89 per cent. fat. From 600 to 1,000 lbs. milk were used for each experiment. The whey in the vats cut once with a horizontal blade knife and twice with the ⅜ inch blade knife, tested an average of .23 per cent. fat. The whey from similar vats of milk cut once with the blade horizontal knife and twice with the perpendicular ⅜ inch wire knife, tested an average of .26 per cent. fat. The general tendency was for the whey to test a little higher in fat where the curds were cut with the wire knife. This could be obviated to some extent by using finer wire and by having the steel frame at the end which is inserted into the vat, made sharp so that it would cut its way through the curd instead of bruising it. We understand such knives are now made. The wire curd knife has the advantage of being much lighter to handle and will doubtless supplant the blade curd knife in the near future.

The average yield of cheese per 1,000 lbs. milk was 98.8 lbs. from the blade knife, and 98.5 lbs. by using the wire knife—a slight difference in yield of cheese in favor of the blade knife.

The cheese from the curds cut with the blade knife lost 2.6 per cent. in weight during one month in cold storage, while those cut with the blade knife lost an average of 2.5 per cent. in the same time. In the ordinary ripening (curing) room the cheese from the curds cut with the blade knife lost an average of 3.06 per cent. during one month, while those from cutting with the wire knife lost 3.18 per cent. in one month. The average shrinkage in both places of ripening for each method of cutting was 2.87 per cent. during one month.

The average total score of the cheese for the blade method of cutting, was 93.88 in cold storage, while the cheese made by using the wire knife averaged in the cold storage 93.84, or practically the same. The remainder of the cheese were ripened in the ordinary ripening room. Those from curds cut with the blade knife averaged 90.5 out of a possible 100, while those from cutting with the wire knife scored an average of 89.83.

Conclusions.

1. The tendency was for a slightly greater loss of fat in the whey by using the perpendicular wire knife for cutting curds as compared with the blade knife, both knives having the wires or blades ⅜ of an inch apart.

2. There was little difference in the quality of the cheese, or the shrinkage during ripening, from the two methods.

3. As the wire knife is much lighter and more convenient to handle, we think it is superior to the ordinary steel blade knife for the cutting of curds to be made into Canadian Cheddar cheese.

Moisture in Curd and Cheese.

The experiments relating to this question have now been conducted for five years. During 1907 twelve experiments were made in which 11,266

pounds of milk testing an average of 3.82 per cent. fat were used. The object of the experiment was to see the effect of not stirring curds and also the effect of stirring curds very little after what is commonly known as "dipping" the curd, *i.e.*, removal of the whey or liquid part from the curd or solid material. For these tests, from 600 to 1,400 lbs. milk, as delivered by patrons who live near the College was mixed, colored and culture (starter) was added at the rate of about one per cent. The milk was then divided equally between two vats and both worked as nearly alike as possible up to the time of "dipping." The A vats of curd were not stirred at all or were stirred very little. The B vats were treated in a normal manner, *i.e.*, were stirred a number of times after dipping, until the cheesemaker considered the curd had about the proper degree of moisture before allowing it to mat, *i.e.*, become a solid mass.

TABLE SHOWING PERCENTAGE OF MOISTURE IN CURD AND CHEESE.

Kind of Curd and Cheese.	Per cent. Moisture in Curd at			Per cent. Moisture in	
	Dipping.	Milling.	Salting.	Green Cheese.	Cheese 1 month old
A. Excessive moisture	53.670	40.884	39.057	34.777	34.05
B. Normal moisture	48.437	39.633	38.346	34.272	33.81
Average difference	5.233	1.251	.711	.505	.14

It will be seen by the foregoing table that the normal curds averaged about five per cent. less moisture at the time of "dipping" than did those which were not stirred. At milling, the difference in the moisture content was a little over one per cent., at salting about three-quarters of one per cent., and in the green cheese the difference had fallen to one-half per cent, while at the end of one month there was very little difference in the moisture content of the cheese. Stated another way: The curd with an excessive amount of moisture at the time of dipping lost nearly 24 per cent. of its moisture between dipping and milling; 4½ per cent. between milling and salting; 11 per cent. between salting and green cheese, and 2 per cent. while ripening for one month—part in an ordinary ripening room and part in an ice cold-storage.

The normal curds lost about 18 per cent. of their moisture between dipping and milling; 3 per cent. between milling and salting; 10 per cent. between salting and time of taking cheese from the hoops (green cheese) and about one and one-third per cent. while ripening for one month—part of the cheese in an ordinary ripening (curing) room and part in cold-storage (ice).

The greatest percentage of moisture lost was between dipping and milling in both lots and the next greatest loss was between the salting stage and that of green cheese. These losses at the different stages of cheesemaking for both curds are seen more strikingly in the table.

The moisture in all cases was determined by following the method described in my last report, viz., drying for about five hours in a steam heated oven at a temperature of 100° to 105°C.

TABLE SHOWING PERCENTAGE OF MOISTURE LOST IN CURD AND CHEESE AT DIFFERENT STAGES.

Kind of Curd and Cheese.	Per Cent. Moisture lost between			
	Dipping and Milling.	Milling and Salting.	Salting and Green Cheese.	Green and Ripened Cheese.
A. Excessive moisture at dipping.....	23.8	4.4	10.9	2.1
B. Normal moisture at dipping.....	18.1	3.2	10.6	1.3

The percentage of fat in the whey averaged .266 for the A lots and .267 for the B lots. The A cheese shrank during one month, 2.04 per cent. in the ice storage (temp. about 40°F.) while the B cheese shrank 2 per cent., or practically the same. Part of the cheese were ripened in an ordinary ripening room to see the effect under conditions as found in average factories. Both the A and B cheese in this room shrank 3.22 per cent., or about one and one-quarter per cent. more than did those lots which were in the ice storage.

The yield of ripened cheese (one month old) per 1,000 lbs. milk was 97.2 for the lots with excessive moisture at the time of dipping and ripened in an ice cold storage. The normal curds yielded an average of 97 lbs. cheese under similar conditions. The lots ripened in the ordinary room yielded per 1,000 lbs. milk, 96.9 and 95.9 lbs. cheese respectively, for those containing an excessive and normal amounts of moisture in the curds at dipping.

QUALITY OF THE CHEESE.

The cheese were scored the first time when six weeks to two months old, and again at intervals of about one month until sold. The table gives the average of all scorings. All cheese were scored full (10) points for "finish," hence, this is not given in detail, but is included in the total score.

Kind of Cheese.	Method of Ripening.	Flavor. 40	Closeness. 15	Color. 15	Texture. 20	Total.
A.—Excessive moisture.....	Ice-cold storage 40°.....	36.7	14.07	14.3	18.4	93.57
B.—Normal "	" " "	36.7	14.14	14.3	18.3	93.50
A.—Excessive moisture.....	Ordinary room 65°.....	35.9	13.35	14.3	17.60	91.20
B.—Normal "	" " "	36.1	13.50	14.4	17.65	91.85

Comments on Foregoing Table.

1. There was practically no difference in the quality of the cheese made from curds having an excessive amount of moisture at dipping as compared with cheese made from curds having a normal amount of moisture, when both were ripened in cold-storage at a temperature of about 40°F.

2. Those lots of cheese made from curds containing an excessive amount of moisture, which were ripened in an ordinary ripening (curing) room tended to be somewhat poorer in quality than were similar cheese made from normal curds. These results agree with those obtained in former experiments and indicate that it may not be advisable to have an excessive amount of moisture in the green cheese when placed in the ordinary room for ripening. In these experiments the average difference in the moisture content of the green cheese was only about one-half of one per cent., but even this amount appeared to have a deleterious effect on the cheese when allowed to remain for a considerable time at a temperature between 60° and 70° F. The cheese ripened at 40° were not so affected in the quality of having an excess of about one-half per cent. moisture in the green cheese.

In addition to the foregoing experiments, five others were made with larger quantities of milk to see if similar results were obtained. The factoryman may object to the previously reported tests on the ground that the quantity of milk was too small. In studying dairying principles, it is well not to have too large an amount of milk to handle, otherwise we may not be able to control all the conditions and consequently defeat the special objects we have in view. It is at this point many experimenters fail. They either try to get too much out of one experiment, or have so much milk to handle that it gets beyond their control for accurate observations.

In order to study the effect of not stirring curds from a larger volume of milk than that used in previous work, five lots of milk totalling 10,570 lbs., averaging 2,114 lbs. each, and testing 3.8 per cent. fat, were treated the same as those from smaller vats with an excessive moisture, except that in these experiments the curds were dipped into a tin-lined curd sink having wooden racks covered with a cloth for draining purposes, such as is common in Western Ontario cheese factories.

The whey tested an average of .24 per cent. fat. The cheese were ripened in mechanical cold-storage at a temperature of about 40° F. During one month they lost an average of 2.9 per cent. in weight. The yield of cheese one month old was 95.6 lbs. per 1,000 lbs. milk. The lower yield of cheese, as compared with the other experiments reported may be accounted for by the fact that those made with the larger quantities of milk were conducted on Mondays of the week. Milk held over Sunday never produces so large a yield of cheese as will similar milk delivered daily.

The average percentages of moisture in the curd were, 53.76 at dipping; 41.58 at milling, and 34.46 at salting. The green cheese contained an average of 33.88 per cent. and the cheese at the end of one month 34.36 per cent. moisture. We are unable to account for this apparent increase of moisture in the cheese at end of one month, unless due to errors in sampling. The loss of moisture between dipping and milling was 22.6 per cent.; between milling and salting 7.5 per cent., and between salting and green cheese 11.9 per cent. of the moisture in the curd at the time of dipping was lost. These results agree fairly close with those obtained in the other experiments, except at the stage between milling and salting, when the loss of moisture in these larger curds was greater.

The average score of the cheese was 34.85 points in favor, 14.07 for closeness; 14.3 for even color; 17.3 for texture and a total of 90.5, including 10 for finish. The quality of the cheese was apparently not so good as in the previous experiments. This may be partly accounted for by the fact that the cheese were made from Monday's milk, which is usually poorer in physical qualities, *i.e.*, it is more likely to be "gassy," "over-ripe," have bad flavors, etc.

Conclusions.

1. The acid developed somewhat faster on the moist curds after dipping. Both curds had an average of .19 per cent. acid at dipping. The curds left moist had developed .635 per cent. at milling while the normal curds had .55. At salting the moist curds had .949 per cent. acid and the normal curds .91. These facts indicate that a maker may expect the acid to "work faster" on the moist curds and he needs to be careful that it does not "get ahead of him." With proper facilities for draining the curd there is little danger on this point.

2. Last year with a difference of 4.682 per cent. moisture in the curds at the time of dipping, the green cheese contained a difference of "less than one-half of one per cent." This year, the average difference in the curds at dipping was 5.233 per cent., and again the difference in the moisture of green cheese was about one-half of one per cent. Practically the same relative difference continued in the cheese at the end of one month. In the curds and cheese from larger quantities of milk, we find about the same percentage of moisture as from the smaller vats. Many makers spend a great deal of energy "stirring curds," which according to these experiments might be saved, as the curds will, if properly handled, drain sufficiently of themselves and an increased yield of cheese will result. For the last three years we have obtained an increased yield of cheese of from one-half to one pound per 1,000 lbs. milk by following this plan. We do not advise cheesemakers to hastily change their methods, but to try the plan in a small way at first. One maker has told us that he was able to make quite an increased yield of cheese at his factory by following the suggestions given along this line, and he also thought the quality of his cheese was as good as when he followed the older method of stirring the curd; in fact he thought his cheese were better, more "meaty" etc.

3. The greatest loss of moisture appears to be at the stage between dipping and milling, probably about 20 per cent. of the total moisture in the curd being lost at this time. The next greatest loss is apparently after salting, when the addition of salt causes a rapid expulsion of the whey. Fr m 10 to 12 per cent. of the moisture at the time of dipping is expelled at this time. From 3 to 4 per cent. is lost between milling and salting and 1 to 3 per cent. while ripening for a month in cold storage at 40° F. The loss is greater than this in an ordinary ripening room, depending upon temperature of room, size of cheese, etc.

Acidity of Curd at Time of Salting.

This is the third year in which we have conducted experiments to determine the effect of salting curds from one to two hours sooner than is sometimes considered safe by Canadian Cheddar cheesemakers. If salted before the curds become "mellow" and show "considerable grease," the maker is afraid his cheese will be "open." All the time the curd is held for the development of this "mellow feel" the fat is gradually oozing out, which means a distinct loss in cheesemaking material and it is doubtful if the gain in "closeness" compensates for the loss of moisture, caseous material, and fat.

During the past season, twenty-five experiments were made on this question to determine the loss from ripening curds too much before salting and also to determine the effect on the quality of the cheese when salting took place one to two hours sooner than is customary with some makers. For the tests, 30,420 lbs. milk were used. The average percentage of fat in the milk was 3.8, and in the whey .23. From 600 to 2,100 lbs. milk were used for each experiment. The curd of each experiment was kept in one lot until the

first curd was ready for salting. At this time the curd was divided into two or three equal parts by weight, according to the amount of curd on hand. If the quantity of curd was sufficient for only two cheese, then the curd was divided into two equal parts, one of which was salted about one hour before the other. If the quantity of curd was sufficient to divide into three cheese, then one curd was salted two hours sooner and the other about one hour sooner than the third curd. The table shows the main points in the experiments.

Table Showing Results of Salting at Various Stages of Acidity.

Cheese	Average % acid at			Av. time from Dipping to Salting	Av. Lbs Ripened Cheese per 1000 Lbs Milk	Average Temp. of Ripening room	Av % Moisture in air of Ripening room	Av % Shrinkage in one Month	Average Score for				
	Dipping	Milling	Salting						Flavor 40	Closeness 15	Color 15	Texture 20	Total 100
				H.M.									
A	.193	.657	.81	3.2	98.9	41.3°F	83	2.67	36.6	13.91	14.23	18.44	93.18
B	.193	.657	.93	4.11	98.6	41.3°F	83	2.45	36.4	13.94	14.23	18.18	92.82
C	.193	.657	—	5.15	97.2	41.3°F	83	2.32	36.4	14.05	14.30	18.30	93.05
A	.186	.588	.78	3.2	97.9	57.9°	78.5	3.24	35.82	13.9	14.4	17.36	91.5
B	.186	.588	.89	3.48	97.0	57.9°	78.5	3.05	35.63	13.8	14.36	17.11	90.9
C	.186	.588	—	5.1	96.1	57.9°	78.5	2.80	35.40	14.1	14.4	17.10	91.0

Conclusions.

1. The increased yield of cheese ripened in cold storage by salting on an average of about three hours after dipping was over 1½ lbs. per 1,000 lbs. milk as compared with salting about five hours after dipping. In the case of cheese ripened in the ordinary ripening (curing) room at about 58° F., the increased yield of cheese was nearly two pounds per 1,000 lbs. milk by salting at the end of three hours as compared with five hours after dipping. By lengthening the time of salting to about 3¾ hours after dipping, the decreased yield of cheese was about one-third of a pound in cold storage and nearly one pound in the ordinary room, per 1,000 lbs. milk. This difference in time corresponds to about .1 per cent. of acid increase for each hour, after three hours from dipping. It was difficult to secure sufficient whey for a reliable acid test in the case of the C. cheese, hence the acidity on these is omitted.

2. The shrinkage was somewhat greater from the cheese salted early, both in cold storage and in the ordinary room, indicating that some at least of the extra moi ture retained in the curds salted early is lost during the ripening (curing) process.

3. There was apparently very little difference in the quality of the cheese made from the curds salted at the different stages of acidity. What difference there was seemed in favor of the cheese salted early, as indicated by the total score, though those salted later tended to be somewhat closer in body.

4. Cheesemakers may very well consider whether or not it will pay to wait one or two hours longer than usual for the curd to "mellow down," thus wasting cheesemaking material and losing valuable time. A few careful experiments will enable a man to know how much acidity at the time of salting is needed in order to produce fine cheese. To go beyond this point is unnecessary.

All of which is respectfully submitted.

H. H. DEAN.

November 30, 1907.

PART X.

THE PROFESSOR OF BACTERIOLOGY.

To the President of the Ontario Agricultural College:

Sir,—I have the honor to submit the following report of work done by the department of Bacteriology during the year ending November 30th.

Instruction.

Courses were conducted for College, Macdonald and short course students as laid down in their respective calendars.

One man is pursuing the Bacteriology option this year, and five seniors are working theses in this laboratory.

The methods of instruction varied somewhat from previous years. The sophomore work was made to consist as largely as possible of lecture room and laboratory demonstrations, although the size of the class precluded the possibility of giving systematic laboratory work. The seniors in the Agriculture option have received laboratory work only, instead of lectures only as heretofore, and the greatly increased interest they have displayed in the subject is gratifying. It also furnishes a true index of the necessity for further laboratory work. No science can be successfully taught by lectures and text books alone. No boy can learn to plow by observing pictures and reading descriptions of various kinds of plows and methods as to their use, be the instruction ever so lucid. He must needs get into the field and plow. Show a boy pictures and text book descriptions of organisms so small that a powerful microscope is required to render them visible to his eye, and explain to him that the presence of such organisms in the soil is as essential in the production of crops as the use of the plow itself. He is unable to comprehend such a possibility. Yet give him an opportunity to handle such organisms in the laboratory, and he will soon determine for himself that micro-organisms are essential, not only in actual tillage of the soil, but in every phase of his farm life. Further, he learns how to handle these organisms in a practical way, using to the best advantage those that are useful, and combatting with success those that are harmful. At the close of the lecture course to the sophomore class last winter the men were asked for a written expression of opinion as to how the course might be improved, and they were almost unanimous in the statement that without laboratory practice they were unable to form clear ideas of the work, and that as the instruction must necessarily be carried on in the present quarters of the department, the retaining of it must be a mere matter of memorizing.

Upon no science is successful agriculture more dependent than upon Bacteriology. The best agricultural colleges of the United States already have extensive courses in Bacteriology, and I would respectfully urge upon you the necessity for more time and more ample laboratory space for instruction in Bacteriology in this College.

Meetings Attended.

I addressed two meetings during the year, the Western Ontario Dairymen's Association on "Bacteria and Milking Machines," and the annual meeting of the Mohawk Farmers' Institute on "Bacteria as Related to Farming."

Two special lectures on canning and preserving of fruits and vegetables were given to the Domestic Science classes of Macdonald Institute.

Publications.

The result of our investigation as to the bacterial content of milk as influenced by the Burrell-Lawrence-Kennedy milking machine, was published in collaboration with Prof. Dean's investigation as Bulletin 159.

One press bulletin was written, and a few contributions were made by Mr. Barlow and myself to current agricultural periodicals.

Routine Laboratory Work and Analyses.

During the year we have distributed sixty doses of tuberculin and eighty-six lactic starters for creameries and cheese factories.

Bacteriological analyses and reports were made on the following specimens during the year:

Anthrax	3	Contagious abortion (suspected)	1
Cat (suspected poisoning)	1	Ice	5
Cheese	1	Milk (off flavored or suspected of causing disease)	7
Diseased hens	25	Plant Diseases	7
" chicks	3	Pus	3
" goslings	2	Sputum (suspected tuberculosis)	5
" pheasant	1	Tuberculosis (animal)	1
" turkey	1	Suspected diphtheria	6
" organs	4	Urine	1
Dog (suspected poisoning)	1	Water	9
Fire Blight	2		
Foul Brood	1	Total	93
Hog Cholera	2		
Hydro-nephrosis in hog	1		

The preparation and distribution of cultures for inoculating the seed of legumes has taken a great deal of time. The accompanying table shows the number and kinds of cultures sent and their destination:

Province.	Alfalfa.	Red Clover.	Beans.	Soy Beans	Alsike.	Peas.	Vetches.
Ontario	170	54	5	1	2	29	1
Quebec	11	3	2	—	—	3	—
Nova Scotia	3	4	4	—	2	2	—
New Brunswick	5	3	—	—	—	—	—
P. E. Island	3	—	—	—	—	—	—
Newfoundland	1	—	—	—	—	—	—
Manitoba	1	5	—	—	—	2	—
Saskatchewan	4	2	—	—	—	—	—
Alberta	18	—	—	—	—	—	—
British Columbia	6	4	—	—	—	2	—
United States	8	1	—	1	2	—	—
England	—	5	—	—	—	—	—
Scotland	—	1	—	—	1	—	—
Total	230	82	11	2	7	38	1

Besides these, one hundred and eighteen cultures were prepared and sent for the Truro Agricultural College. Reports were received from experimenters as shown in the following table, benefit having been derived from the use of the culture in a little over fifty-four per cent. of the experiments:

Province.	Alfalfa.		Red Clover.		Alsike Clover.		Peas.		Beans.		Sweet Pea.	
	Benefit.	No Benefit.	Benefit.	No Benefit.	Benefit.	No Benefit.	Benefit.	No Benefit.	Benefit.	No Benefit.	Benefit.	No Benefit.
Ontario	36	28	6	11	2	..	2	2	1	..	..	..
New Brunswick	2	..	1	..	..	..	..	..	..	..	..	..
Saskatchewan	1	2	..	..	..	..	..	..	..	..	..	..
Alberta	1	1	..	..	..	..	..	..	..	..	..	..
P. E. Island	2	.	..	..	..	..	..	..	..	..	..	..
British Columbia	1	2	..	2	..	..	..	..	..	..	1	1
Quebec	3	1	..	..	..	..	..	..	..	1	1	..
Manitoba	1	1	..	1	..	..	..	..	..	..	..	..
Nova Scotia	1	..	2	..	..	1	..	..	2	..	..	..
Indiana	..	1	..	..	..	..	..	..	..	..	..	..
England	..	..	..	1	..	..	..	..	..	..	..	..
Ohio	..	..	..	..	1	..	..	..	..	..	..	..
Total	48	36	9	15	3	1	2	2	3	1	2	1

The complete report of this branch of the work has already been submitted for publication as a Bulletin of the College.

Research.

We have given considerable attention to research, part of which is complete. Other problems are still under investigation.

Some investigation was conducted upon the disease of incubator chicks known as white diarrhœa. A large number of autopsies were held on healthy and diseased chicks, microscopic and cultural examinations and inoculations of healthy chicks were made, all of which gave negative results, and the conclusion was drawn that white diarrhœa is not an infectious disease. A full report of our work, with a resumé of work done in previous years by Harrison and Barlow, has been submitted for publication jointly with the result of investigation in other departments of the College on the same subject.

During the past few weeks considerable time has been spent visiting canneries of the Province, and in correspondence with Canadian and United States canneries, gathering information as to the nature and amount of cannery refuse, with a view to aiding the Canadian canners by devising a plan for the economic or destructive disposal of such refuse. This work was started late in the canning season and no definite results are yet available.

During the summer considerable loss occurred in the College cucumber forcing house from failure of the fruit to set, or in some cases failure to mature after being well started. Many of the young fruits, and in some cases the tips of pruned stems, showed a soft rot. Several species of common saprophytic bacteria were isolated from these affected portions and inoculated into the healthy plant tissue. These inoculations were negative in every instance, as would be expected from saprophytic forms. The partial failure of the

crop was attributed to faulty "climatic conditions" present in the forcing house, which lowered the natural vitality and resistance of the plants, rendering them susceptible in a limited degree to infection from ordinary saprophytic bacteria.

Cabbage Resistance to Black Rot.—Among the varieties of cabbage grown this season in the garden of the Horticultural Department, there was one, the Houser, which had been advertised as proof against black rot. This Houser cabbage grew with great vigor and suffered no appreciable injury from the disease, and it was only by close observation that occasional infections could be found. Other varieties grown in adjacent rows suffered severely from black rot as they have in previous years. Our seniors in Horticulture and Biology potted some of these Houser cabbages and inoculated them in the laboratory with pure cultures of the black rot bacteria. The disease did develop from the point of inoculation, but advanced slowly, and even under these severe laboratory conditions it worked but little injury. Some of the inoculations were without any result. We conclude that this variety of cabbage is practically immune to black rot under field conditions.

I take this opportunity to express my appreciation of the assistance of Mr. Barlow, who has labored diligently and persistently and has contributed largely to such success as the laboratory has achieved during the year.

Respectfully submitted,

S. F. EDWARDS.

November 30th, 1907.

PART XI.

THE PROFESSOR OF HORTICULTURE.

To the President of the Ontario Agricultural College:

SIR,—I have the honor of presenting herewith my fifteenth annual report on the work of the Horticultural department.

HORTICULTURE ON THE COLLEGE CURRICULUM.

In doing so I wish to refer briefly to the great development which has been made in the horticultural course at the College, and also horticultural work throughout the Province. When I took charge of the department fifteen years ago, the course in horticulture consisted of not more than half a dozen lectures, which were principally on fruit-growing and were given to the students of the second year only. At that time horticulture had not made the progress in Ontario it has to-day, and such a course did not seriously reflect upon the College as a progressive institution. But times have changed since then. We now offer a wide course of instruction in horticulture in all its branches, including fruit-growing, vegetable gardening, floriculture, and landscape gardening. First year students receive an extensive course in the first principles of horticulture. Second year students receive a course in lectures throughout the year covering all branches of the subject, and in connection therewith get regular instruction through demonstration and practical work. Fourth year students who take the degree course may now specialize in horticulture and take an extended course in this subject in all of its branches.

With the addition of the Macdonald Institute as a department of the College, the ladies now take a course in horticulture in which special emphasis is put upon floriculture and landscape gardening as applied to home decoration. The teachers' classes attending the Institute also receive a course in horticulture as applied to the management of school gardens.

From this it will be seen that within comparatively few years horticulture has been developed from a very minor subject on the College curriculum to a major one with many branches in which students may specialize and prepare for a University degree.

HORTICULTURAL DEVELOPMENT IN ONTARIO.

Great as this development on our College curriculum may seem, it has not in any way exceeded the demand from the public, because in no other field has there been a more rapid development and greater specialization throughout the country during the last few years than in horticulture. Fruit-growing has become one of our leading industries, and as evidence of the progressiveness of those engaged in it, we may point out that there are now in Ontario over fifty local and provincial fruit-growers' associations.

Vegetable gardening has also become an important industry, particularly in proximity to towns and cities, so much so that a provincial organization has been formed with which is allied a score or more of local vegetable growers' associations. Floriculture has also made wonderful progress, both from a commercial and an amateur standpoint. In Ontario we now have some of the largest commercial floriculture establishments on the continent, which are shipping cut flowers from one side of the continent to the other. The florists, too, have united for their own best interests in the formation of a number of organizations, both local and provincial.

All of the foregoing are interested in one or another of the various branches of horticulture in a commercial way. In addition to these we have an ever increasing number in both town and country who are giving more and more attention to horticulture from the amateur and aesthetic standpoints. In cities and towns horticultural societies are making progress in beautifying lawns and boulevards and establishing parks and pleasure grounds. In the country progressive property owners are beginning to realize the importance of beautifying home surroundings. As an evidence of the growing interest in this phase of horticulture, we have a Provincial Horticultural Association and sixty-six local horticultural societies, all promoting the work of civic and rural improvement.

Reorganization and Development Needed.

While the instruction of students might naturally be supposed to be the first consideration of our college staff, yet with the great development and organization in the country, the public has learned to look to the College more and more for definite information on all kinds of subjects, and solutions for the many problems which confront the grower. This necessitates much careful investigation and experimental work. In this department at present the responsibility for this work falls upon the teaching staff, which is already occupied the greater part of the year with college work. In this particular there is need for reorganization and greater addition to our staff of workers. The time has arrived when the development and progress of horticulture in this country calls for specialists in the various lines of horticultural work. When the work is so arranged and competent specialists put in charge of it, more will be accomplished and better work will be done.

In presenting a report of the year's work I shall give first a brief outline of the work carried on by the department as a whole. A fuller account of some of the more important work therein indicated will be given under one or another of the four headings: fruit-growing, vegetable gardening, landscape gardening, and floriculture, the branches into which horticulture most naturally is divided.

Outline of the Work in the Horticultural Department.

1. Lecturing to students of the freshman, sophomore, and senior classes; also to the ladies' classes of the Macdonald Institute, and classes of teachers attending the College.

2. Lecturing at horticultural societies and public meetings in about thirty different parts of the Province, and addressing as many excursions visiting the College during the month of June, explaining to them the work in progress in the department.

3 Judging horticultural exhibits at about twenty of the fall fairs and horticultural exhibitions held in various parts of Ontario.

4. Conducting tests with several hundred varieties of fruits in our experimental orchards and small fruit plantation.

5. Originating and testing new varieties of fruits by systematic selection and plant breeding. Several thousand seedlings are now under test.

6. Conducting extensive field and forcing-house experiments with all kinds of vegetable garden crops.

7. Supplying the College and Macdonald Hall with fruits and vegetables throughout the year.

8. Adding a large number of specimens to our museum collections of fruit and vegetable models. This exhibit has now become one of the attractions of the place.

9. Maintaining and keeping in attractive condition forty-two acres of lawn and grounds, upon which are being tested hundreds of varieties of trees, shrubs, and ornamental plants.

10. Assisting a number of school boards and private owners in preparing plans for the improvement of their grounds.

11. Furnishing seeds, plants, and instructions this year to over 3,800 co-operative experimenters. Material has now been distributed for over 8,000 experiments. For an account of this work see the Report of the Experimental Union.

12. Inspecting and reporting upon the work of the twelve Ontario Fruit Experiment Stations. For fuller account of this see the Report of the Ontario Fruit Experiment Stations.

13. Contributing articles on horticultural topics to various newspapers, journals, and magazines.

14. Answering by correspondence thousands of questions sent in from all parts of the country relating to all branches of horticulture.

FRUIT GROWING.

A full course of instruction as outlined in the College curriculum has been given in fruit-growing to the students of the first, second and fourth years. In this work I was ably assisted during the early part of the year by Mr. H. S. Peart, who left in May to take charge of the new Horticultural Experiment Station at Jordan Harbor, and later by Mr. J. W. Crow, who graduated as a specialist in horticulture in May and came on at once to take up Mr. Peart's work. Mr. Crow was given charge of the orchards and fruit plantation, and has prepared the following report on the investigation work conducted therein.

Plant Breeding.

The crossing of strawberries and raspberries was largely discontinued this year, and improvement by means of careful selection of plants for propagation purposes was begun. Selection was made of the Older black raspberry,

with a view to improving the habit of growth and bearing qualities of the variety. Selection of specially grown strawberry plants of certain varieties will be made during the fruiting season next year.

Attempts were made to cross the European and American plums, *Prunus domestica* and *P. Americana*. The crosses were made reciprocally, several hundred blossoms being operated on in each case. No fruits resulted on any of the Americans, but four fruits were secured as a result of using Americana pollen on Glass Seedling and Shipper's Pride, varieties of *P. domestica*. One fruit was also secured by using Americana pollen on Burbank, a Japanese plum. It was found impracticable to cover the emasculated blossoms on a large scale, and there is consequently a possibility that the fruits procured are the result of natural pollination. It is hoped, however, that such may not prove to be the fact, as no case is on record so far as the writer is aware in which *P. Americana* and *P. domestica* have been successfully hybridized.

A number of crosses were made in apples and small quantities of seed have been secured.

No fruits were produced on Smith's Bigarreau, a sweet cherry, under pollen of several varieties of the sour, or *Prunus cerasus*, class. Montmorency, a sour cherry, was apparently successfully crossed with the cultivated plums, but although the fruits reached nearly full size, they failed to mature.

Prunus Virginiana, the common wild choke-cherry, was successfully crossed with the sour cultivated cherry and with the cultivated plums.

Seed of blueberries was procured and planted, and an attempt will be made to bring this valuable native fruit under cultivation.

Cover Crops.

The choice of a cover crop depends somewhat on local conditions. On light soils, where it becomes necessary to conserve all the moisture possible, crops which are killed by the cold of winter are preferred. On our cold, wet soil, however, we desire to get rid of a considerable surplus of soil water in spring. For that reason we have found the hardy cover crops more satisfactory because they make strong growth early in the spring and thereby dispose of large quantities of useless moisture. Those which have given the best results in five years' tests are:

Leguminous. Hairy Vetch, thirty to thirty-five pounds per acre. Alfalfa, twenty-five to thirty pounds per acre. Mammoth and red clover (equal in value), twenty pounds per acre.

Non-leguminous. Winter rye, one and one-half bushels per acre.

All of these crops form fairly thick covers, but they are all open to objection because of their failure to catch and hold drifting snow.

Orchard Fruits.

Results secured to date in the growing of tree fruits at this station are published in the hope that they may prove of value to intending planters in this and similar sections.

In 1897 there was planted by this department an orchard consisting of 280 apple, 120 pear, 120 plum, and 80 cherry trees. Three trees each, of 182 varieties, were planted, but the numbers have since been very much reduced by the severity of the winters, added to the unfavorableness of the soil and site.

Practically all the sweet cherries have been destroyed, and Richmond, Montmorency, and Dyehouse are the only sour ones of value remaining. These latter are rapidly decreasing in numbers.

The only plum worth planting in this section, according to the results of this test, is Glass Seedling. It has not sun-scalded and seems to stand the winter without injury. The American plums are, of course, hardy, but the fruit is so little valued that they should not be planted where any other sort can be grown.

Flemish Beauty seems to be the hardiest pear of any value, but is quite subject to sun scald, blight and scab. Bessemianka, a Russian variety, is very hardy and vigorous, but is worthless so far as fruit is concerned. It will be tested as a stock for top-grafting. It has not blighted. Clapp's Favorite has done fairly well, but it is subject to blight.

A fair proportion of the original eighty-five varieties of apples have made average growth. Some, like Baldwin, have killed out entirely and a large number have made but indifferent progress. Following are the total yields to date of individual trees of those varieties in the young orchard which have given the largest crops. The years in which appreciable quantities of fruit were first borne are also given. All were planted in the spring of 1897.

HEAVIEST YIELDING VARIETIES TO DATE IN YOUNG ORCHARD.

Variety.	Bore Fruit in	Total Yield.	Average per year.
Shackleford	1904	9.5 bus.	2.3 bus.
Trenton	"	9. "	2.2 "
Utter	"	8. "	2.0 "
Ben Davis	"	7.5 "	1.8 "
Gano	1903	7. "	1.4 "
Stark	"	6.5 "	1.3 "
Hurlbut	1904	6.5 "	1.6 "
Tolman Sweet	"	6. "	1.5 "
McMahon White	1905	6. "	2.0 "
Wealthy	1903	5.5 "	1.1 "
Pewaukee	1905	5.5 "	1.8 "

Shackleford, Gano and Stark all belong to the Ben Davis class or type, and these figures show plainly why so many trees of this class are being planted by Ontario apple growers. They produce good crops before many other varieties reach the age of profitable fruit-bearing. It is doubtful, however, if the extensive planting of these varieties is to be commended. Shackleford we would not recommend on any account because of its light color. Gano is very similar to Ben Davis, while Stark is a slight improvement on that variety in respect to quality. There is no doubt that these varieties when grown in large enough quantities to attract exporters are money makers, but for general planting their use should be discouraged. Trenton is a very promising and, where it has been tried, a very useful and profitable fall apple. Utter is a poorly-colored late fall variety. It is very susceptible to "Bordeaux injury," and on that account also is not desirable. Hurlbut has little to recommend it. McMahon and Tolman are very hardy varieties and are adapted only to those sections where extreme hardiness is a necessity.

It will be noticed that Spy, Snow, McIntosh, Golden Russet, and other standard varieties are not included in the above list. They have not come into full bearing as yet. Eleven years is a comparatively short period in the lifetime of an apple orchard, but planters should consider the distant as well as the near future in making selection of varieties. A study of the older planting of apples on the College farm gives more reliable results and shows the necessity of looking at a question of this kind from all sides. About twenty years ago three acres of the present orchard were planted to apples. Some of these still standing are, as nearly as we can ascertain, twenty-two years of age. Many are at least eighteen years old and some few were planted still more recently.

The following table gives the number of trees of each variety and the total and average yields per tree for the five years, 1903 to 1907 inclusive. Most of the varieties have, we think, demonstrated their right to be classed as hardy in this locality. Spy is not usually classed as such but we have no more healthy and productive trees than certain of our Spys. The Wallbridge trees are all in a decrepit state, as a probable result of recent winter injury, as are also occasional specimens of other varieties. Those varieties apparently most vigorous and hardiest are designated by an asterisk:

Average Yield of Varieties in Old Orchard for the Last Five Years.

Variety.	Number of trees.	Total Yield per tree for five years.	Average Yield per tree for five years.
*Salome	1	28.5 bus.	5.7 bus.
*Spy	7	27.7 "	5.5 "
*Yellow Transparent	4	16.5 "	3.3 "
Ben Davis	1	15.0 "	3.0 "
*Alexander	4	12.9 "	2.5 "
*Wealthy	5	12.5 "	2.5 "
Gravenstein	1	12.0 "	2.4 "
*Duchess	6	11.7 "	2.3 "
Wallbridge	11	10.5 "	2.1 "
*Bellflower	4	10.5 "	2.1 "
*Snow	9	9.9 "	1.9 "
*Astrachan	2	9.5 "	1.9 "
*Colvert	2	9.2 "	1.8 "
*Golden Russet	3	7.0 "	1.4 "
*St. Lawrence	5	5.8 "	1.1 "
Haas	1	5.0 "	1.0 "

The figures show that Spys, if planted thirty-five feet apart, would produce sixty-four barrels per acre per year. Wealthy planted at twenty-five feet, which would be a fair distance in this section, would yield fifty-eight barrels per year per acre. It will be noticed that Salome is credited with the largest yield per tree per year. Only one tree of this variety has been tested, and these results consequently cannot be taken as conclusive. The best records for individual tree performance is held by Spy, three trees of which have given a total yield for the five years of forty-seven and three-quarters, thirty-six, and thirty bushels respectively. Average results are secured

only by testing a number of trees of each variety, and only in those cases in which several trees are reported on should the results be taken as at all representative of the possibilities of the variety.

Sterility and Partial Fertilization of Apple Blossoms.

Investigations conducted in this department in 1905 and 1906 by *Mr. G. E. Sanders, B.S.A., have thrown considerable light on certain economic problems intimately connected with orcharding. Certain varieties of fruit. Northern Spy, for instance, are known to be altogether unable to fertilize their own blossoms and produce fruit if planted by themselves. This condition is called "Self-sterility." In addition to this another condition is recognized called "partial" or "imperfect fertilization," in which a part only of the carpels or ovules of the fruit become properly impregnated.

The cause of this latter condition is an insufficient supply of suitable pollen. It results in smaller fruit, greater liability to attacks of scab and a much heavier loss by dropping throughout the growing season.

Smaller fruit is, as a rule, known to be also the result of self-fertilization, even in the case of those varieties which are known to be able to fertilize their own blossoms successfully. It is pointed out that larger fruits usually result if cross-fertilization with some other variety takes place. In the light of these facts, it becomes of great importance for the fruit-grower to study carefully the causes and remedies for these peculiar conditions.

The remedy for self-sterility is, obviously, mixed planting with varieties which bloom at the same time. Given a proper selection of varieties, the evils of self-fertilization and imperfect fertilization may also be overcome by making the conditions as favorable to cross-fertilization as possible. Careful experiment has shown that practically all the labor of cross-pollination is performed by bees. If these are not numerous enough, they should be supplied, and experience has proven that beneficial results often follow the introduction of a few hives of bees into the vicinity of orchards.

Mr. Sanders also points out that trees not allowed to overbear were better able to mature imperfectly fertilized fruits than were overloaded trees. It would seem wise, therefore, not only to thin the fruit, but also to nourish and strengthen the trees by cultivation and in every other way possible.

For the guidance of planters, Mr. Sanders compiled a table giving the relative blooming periods of all varieties tested and also the results of his tests for self-sterility. Following are extracts from the compilation relative to the characteristics of the leading commercial varieties. The dates of blooming were noted in 1904 and may be taken as indicating approximately the relative blooming period of each variety. So far as the writer is at present aware the varieties marked by an asterisk have always been found self-sterile. The results of sterility tests conducted in 1907 are added as supplementary to the results obtained and compiled by Mr. Sanders.

*See Mr. Sanders' graduating thesis on this subject, presented in this department in 1907.

RELATIVE BLOOMING PERIODS AND RESULTS OF TESTS OF SELF-STERILITY OF APPLES.

	Found self-fertile in					Found self-fertile elsewhere.	Began to bloom in 1904.
	1903	1904	1905	1906	1907		
Duchess	.....	.....	1	1	1	.....	May 26
Golden Russet	.....	.....	.....	.....	.....	1	"
Wealthy	.....	1	1	1	1	.....	"
Snow	.....	.....	.....	1	1	1	"
Yellow Transparent	.....	.....	.....	.....	.....	1	"
Scott's Winter	.....	.....	1	1	1	.....	"
*Winter St. Lawrence	.....	.....	.....	.....	.....	.....	"
Wagener	.....	.....	1	.....	.....	.....	"
Astrachan	.....	.....	.....	.....	.....	1	May 27
*Ben Davis	.....	.....	.....	.....	.....	.....	May 28
*Gravenstein	.....	.....	.....	.....	.....	.....	"
Fallawater	.....	.....	.....	.....	.....	1	"
*McIntosh	.....	.....	.....	.....	.....	.....	"
*Pewaukee	.....	.....	.....	.....	.....	.....	"
*Blenheim	.....	.....	.....	.....	.....	.....	"
Tolman	.....	.....	.....	.....	.....	1	May 29
Cranberry (not tested)	.....	.....	.....	.....	.....	.....	"
Alexander	.....	.....	.....	.....	.....	1	"
Baxter (not tested)	.....	.....	.....	.....	.....	.....	"
Ribston	.....	.....	1	.....	.....	.....	"
Wolfe River (not tested)	.....	.....	.....	.....	.....	.....	"
*Spy	.....	.....	.....	.....	.....	.....	"
McMahon White	.....	.....	1	.....	1	.....	"
Trenton	.....	.....	1	.....	.....	.....	"
Stark	.....	.....	.....	.....	.....	1	May 31
*Gano	.....	.....	.....	.....	.....	.....	"
Ontario	1	.....	1	.....	.....	.....	"
*King	.....	.....	.....	.....	.....	.....	"
R. I. Greening	1	.....	1	.....	.....	.....	June 1
Colvert	.....	.....	1	1	.....	.....	"
Hubbardston	.....	.....	1	.....	.....	.....	"
Baldwin	1	.....	.....	.....	.....	.....	

The blooming season usually lasts from six to eight days, depending somewhat on weather conditions.

Sterility tests were also conducted in 1907 with many varieties of pears, cherries and plums. All the plums tested were found to be self-sterile, but Flemish Beauty pear and Dyehouse cherry both tested strongly self-fertile.

SPRAYING.

For an account of an experiment conducted in this department with kerosene emulsion for the control of the Oyster Shell Scale, and for other information on spraying, see the Report of the Professor of Entomology.

SMALL FRUITS.

The results of the variety tests with strawberries and bush fruits which have been in progress for a number of years, are not subject to any important change this year. The list of recommended varieties may be found in previous reports.

*The varieties marked with an asterisk have invariably proved self-sterile.

VEGETABLE GARDENING.

Vegetable gardening is now becoming one of the important industries of this country. Naturally it is carried on most extensively in proximity to the larger towns and cities, although in many rural sections certain truck crops are grown on a large scale and shipped to all parts of the country. About ten acres are devoted here to the growing of vegetables. Careful tests have been made during the past two years with a great variety of truck crops.

Variety tests necessarily require first attention, because the difference between success and failure in the growing of these crops often lies in the selection of the right varieties. When we have determined by careful tests what are a few of the best among the scores of varieties listed in seedsmen's catalogues, we hope to take up the improvement of varieties by selection and methods of cultivation.

Mr. A. McMeans, foreman in this branch, has recorded the data for the following report on this work:

Beans. The variety test of garden beans included seventy-one varieties. Thirty-seven of these were what are known as golden-podded or wax beans, and thirty-four were green podded.

Of the golden-podded varieties the following were among the best:—Keeney's Rustless Golden Wax, Pencil Pod, Golden Wax, Wardell's Kidney Wax, and Golden Queen.

Of the green-podded varieties the best were, Red Valentine, Full Measure, Giant Stringless Green Pod, Refugee Round Pod, and Tennessee Green Pod.

Beets. Sixty-six varieties of table beets were tested, forty-seven of which were classed as turnip-rooted and nineteen were of the long or half-long class.

Of the turnip-shaped varieties the following were a few of the best:—Eclipse, Detroit Dark Red, Dewing's Blood Turnip, Columbia and Early Model.

Black Prince and Black Red Ball are excellent as late varieties for winter use, but are rather slow growers for early use.

Of the long varieties Dobbie's New Purple was one of the best.

Carrots. Among the thirty-one varieties of table carrots under test the best were Chantenay, Rubicon and Danvers. Rubicon is a new variety of the Chantenay type and proved to be one of our heaviest yielders.

Cabbage. Among the sixty-four varieties tested, the following stand out as a few of the best to cover the season from early to late:—Jersey Wakefield, All Head, Early Summer, All Seasons, Danish Ball Head and Flat Dutch.

Of the newer sorts the following are the most promising: Alpha, Eureka, Glory of Enkhousen, Diamond Winter, Danish Round Head, and Houser. The last named has proved less susceptible to rot than any cabbage we have grown.

Among fourteen varieties of Savoy cabbages tested the best were Ironhead, Drumhead, and Perfection (Sutton). The first is early maturing while the other two are later. The Perfection is very finely netted, of attractive appearance and good quality.

Among the twelve varieties of red cabbage tested there was none better than the old standard Mammoth Red Rock.

Celery. Celery has been grown here for many years in large quantities and a number of varieties have been tested. Those which have given the best results are White Plume, Paris Golden Yellow, Giant Dwarf White, and Triumph. These are given in the order of season. The most promising new variety is Chicago Giant Self-Blanching. This resembles White Plume, but is a somewhat stronger grower with larger, thicker stalks of a rather better flavor.

Onions. Forty-two varieties of onions were tested this year and fifty-five the year before. Among all this number there are none better than the old standard varieties we have been growing for years, viz., Yellow Globe Danvers, Prizetaker, and Red Wethersfield. Of the newer kinds the most promising are Ailsa Craig, Gibraltar, and Golden Globe.

Peas. A test was made this year of ninety-four varieties of garden peas. These vary greatly in season and length of vine. In the following list are given a few of the best early, mid season, and late varieties, with record of average length of vines.

Among the earliest kinds were Alaska, Extra Early, First of All, Lightning, and Extra Early Pioneer. These were all very much alike in earliness, productiveness, and size of peas and pods, vines 20 to 24 inches long.

Among the best of the mid-season varieties were, Gregory's Surprise, 24 to 30 inches; Nott's Excelsior, 15 to 17 inches; Ideal (Sutton), 30 to 36 inches; Gradus, 28 to 35 inches; Wm. Hurst, 12 to 14 inches. These produce larger and finer peas than the earlier kinds.

The best of the late peas were Stratagem, 24 to 30 inches; Dwarf Defiance, 22 to 24 inches; Heroine, 30 to 36 inches; Shropshire Hero, 26 to 32 inches; Cooper's Prince Edward, 34 to 36 inches; Hurst's Reliance, 44 to 48 inches; Horsford's Market Garden, 24 to 28 inches. The latter gave an average yield of sixteen pods per plant with an average of over five peas per pod.

Tomatoes. Extensive variety tests with tomatoes have been made here for the past twelve years, but, as a rule, only the earliest kinds mature a full crop in our comparatively short and cool summer season at Guelph. This year seventy-three varieties were included in the test. Eight plants were grown of each variety. The plants were set out in the field on June 11th; the first ripe fruit was picked on August 17th, and the last picking was made on October 2nd.

The following table gives the results from twenty of the heaviest yielding varieties:

Heaviest Yielding Tomatoes.

Name of variety.	Number of fruits 1st picking.	Average weight of fruit per plant.	Average number of fruits per plant.	Average weight of individual fruits.
		Ounces.	Ounces.	Ounces.
Nolte's Earliest	22	373.6	75.8	4.9
Quicksure	11	335.5	51.8	6.4
Early Hustler	12	318.5	59.0	5.3
Supreme Early	13	313.1	50.8	6.1
Wealthy (College)	10	312.6	51.7	6.0
Earliest of All (Vaughan)	32	306.3	111.0	2.7
Wealthy (Bolgiano)	16	305.2	57.0	5.3
Big Victor	5	297.1	54.6	5.4
Dominion Day	10	296.1	49.8	5.9
Earliana (Robertson)	20	295.7	69.7	4.2
King of the Earliest	16	295.3	56.7	5.2
Atlantic Prize	7	291.2	51.2	5.6
Earliest Pink	17	274.3	44.0	6.2
Mikado	6	273.6	30.6	8.9
June Pink	11	272.6	44.0	6.1
Early Ruby	9	261.2	47.2	5.0
I.X.L.	10	247.2	44.7	5.5
Express	12	247.2	47.5	5.2
First of All (Rennie)	9	246.0	41.3	5.9
Earliana (Johnson)	8	237.1	43.2	5.4

From a study of the foregoing table it might be supposed that it included all of the best varieties of tomatoes; as a matter of fact, it includes only the earliest varieties which naturally give the heaviest crop in localities like this and more northern sections where the summer season is comparatively cool and short. The table, therefore, is valuable in showing what varieties are likely to give the best results where earliness is a prime factor.

Taking all things into consideration, we have found Wealthy one of the best varieties on this list. It is early and productive. The fruit is uniformly of nice shape, medium size, firm and of good quality.

For southern sections where the later and usually better varieties of tomatoes can be depended upon to mature a full crop, we would recommend the following to cover the season from early to late, Wealthy, Chalk's Jewel, Stone, and Success.

Forcing House Experiments.

The forcing of vegetables under glass in winter is a phase of the market garden industry which has made great progress during the past five years in many parts of Ontario. After the rebuilding of our greenhouses last year, we were able to devote two houses to vegetable forcing. A brief summary

is here given of some of the experiments undertaken with a number of the crops usually grown under glass.

Lettuce. In a test of sixteen of the varieties of lettuce commonly recommended for forcing purposes, the old standard variety known as Grand Rapids proved best both for yield of crop and suitability for market. Golden Queen, a newer variety, was of the best quality, but was too small and slow of growth to be profitable.

Radishes. In a test of eighteen varieties of radishes the following gave the best results under forcing house conditions: Non Plus Ultra, Rosy Gem, Scarlet Turnip, and White Tip Scarlet Turnip.

With the radish crop a comparison was made between the ordinary seed as purchased from the seedsman and the large plump seed taken from the same sample by screening out the smaller seeds. The results, as shown by the evenness and vigor of the crop, were very marked in favor of the large plump seed.

Water Cress and Parsley. These crops placed in the coolest section of one of the forcing houses gave a continuous yield of crisp, tender leaves throughout the whole winter and were in great demand for relishes and garnishing.

Forcing Cucumbers. In the greenhouse used for radish and lettuce during the winter, cucumbers were grown as a spring and summer crop. A test was made of a number of the large varieties usually known as English or forcing cucumbers.

The first fruits were picked on July 8th and good pickings were secured until August 15th. Among the varieties that gave the best results were the following:

Yield of Forcing Cucumbers.

Name of variety.	Average fruits per vine.	Average weight of fruit.
Prizewinner	29	36.68 ozs.
Delicacy	27	33.76 "
Telegraph	26	31.26 "
Matchless	24	32.91 "
A1	23	30.67 "
Everyday	22	30.58 "
Satisfaction	19	34.50 "

Forcing Tomatoes. One greenhouse was devoted wholly to experimental work in forcing tomatoes. The tests included a comparison of varieties most suitable for greenhouse culture; planting at different distances apart; training to one or two stems; surface watering and sub-irrigation; and fumigating with hydro-cyanic gas for the white fly.

The following table shows the comparative yields of the different varieties trained to single stems on the sub-irrigated and surface watered beds:

YIELD OF TOMATOES IN FORCING HOUSE.

Name of variety.	Sub-irrigated.			Surface watered.		
	Average weight of fruit per plant.	Average number of fruits per plant.	Average weight of fruit.	Average weight of fruit per plant.	Average number of fruits per plant.	Average weight of fruit.
	Ounces.		Ounces.	Ounces.		Ounces.
1. Livingston's Beauty....	195.6	26	7.43	110.6	13	8.51
2. A. 1	176.0	46	3.68	124.6	29	4.25
3. Lester's Prolific.....	172.5	51	3.38	111.3	39	2.79
4. Frogmore	160.5	50	3.21	149.0	35	4.17
5. Chalk's Jewel	156.3	22	6.89	131.6	27	4.87
6. Ignotum	142.6	21	6.79	129.3	16	7.76
7. Select Stone	136.0	22	6.00	120.0	20	6.00
8. Rochford	132.3	31	4.26	148.3	31	4.78
9. Best of All.....	132.0	36	3.66	131.6	44	2.94
10. New Stone	131.6	24	5.48	100.6	18	5.59
11. Combination	123.0	24	5.12	99.0	20	4.79
12. Magnus	122.6	18	6.69	93.6	10	8.78
13. Noble	119.0	20	5.95	103.6	15	6.61
14. Lorillard	117.6	24	4.77	107.0	19	5.53
15. Faultless Early	115.0	25	4.60	121.0	19	5.97
16. Earliest of All.....	109.0	31	3.51	119.0	28	4.25
17. Winter Beauty	107.6	34	3.16	105.0	30	3.42
18. Comet	107.6	35	3.07	101.0	41	2.46

The foregoing table shows the relative productiveness of the varieties in the test, and also the average size of the fruits; but it does not show the smoothness, color and quality of the fruit, very important features in greenhouse tomatoes. Taking all things into consideration, Lester's Prolific was one of the best varieties in the test, and Chalk's Jewel made a good second. Livingston's Beauty, although it gave the heaviest yield, produced fruits too large and rough for a good forcing variety.

SUB-IRRIGATION AND SURFACE WATERING.

The sub-irrigated bed was watered by means of tile placed on a cement bottom under the soil so as to carry the water to all parts of the bed, from where it was taken up by the soil and plant roots above. The surface watered bed was watered in the ordinary way by the hose on the surface of the soil. The results as indicated in the above table show that all but three of the eighteen varieties in the test gave heavier yields on the sub-irrigated bed. The total increase of yield of the sub-irrigated over the surface watered bed was 338.5 ounces, or an increase of 6.3 ounces per plant.

SPACING AND TRAINING TOMATOES IN FORCING HOUSE.

A test was made to find out at what distance apart tomato plants should be set in the bed to give the best returns, and also what effect training to single and double stems would make at the various distances.

The following table gives the results with plants set at one foot, one and one-half, and two feet apart, on both surface watered and sub-irrigated beds:

SPACING AND TRAINING TOMATOES.

Distance apart, feet.	Sub-irrigated.				Surface watered.		
	Number of stems.	Number of fruits per plant.	Weight of individual fruits.	Weight per sq. ft. of bed.	Number of fruits per plant.	Weight of individual fruits.	Weight per sq. ft. of bed.
			ounces.	ounces.		ounces.	ounces.
1 x 1	1	20.5	2.77	56.02	16.1	3.65	54.46
1½ x 1½	1	34.6	3.21	49.09	23.1	3.63	37.23
2 x 2	1	35.4	3.66	32.22	28.3	4.73	30.58
1½ x 1½	2	39.7	2.88	50.56	32.7	3.60	49.45
2 x 2	2	49.0	3.32	38.36	36.6	4.17	35.04

From this it will be seen that the close planting gave the heaviest yield per square foot of bed, but that at the same time there was a decrease in the size of the fruits. It will be noticed, too, that the plants trained to two stems at both one and one-half and two feet apart, gave a greater yield per square foot of bed than where trained to a single stem at these same distances.

FUMIGATING FOR WHITE FLY.

The white fly (*Aleyrodes vaporariorum*) gave serious trouble in the tomato house during the early part of the season, but was finally subdued by fumigating with hydrocyanic gas. For a full account of the plan adopted in using this gas, see the floricultural section of this report on page 150.

FLORICULTURE.

The following report on the floricultural work of the department has been prepared by Mr. William Hunt, Instructor in Floriculture, who has ably taken up this growing section of the work.

The constantly increasing demand for more information and enligtenment on all matters pertaining to floriculture proves conclusively that this branch of horticulture is being more generally practised and is becoming more universally popular every year. Not only is this the case with the regular classes of College and Macdonald Institute students, but also with the various classes of Nature Study students who have attended the College during the past three or four summer terms. These last named classes were composed mainly of school teachers, including inspectors and principals, from all parts of the Dominion. In almost every instance the request was made by them for additional lectures and practical instruction on floriculture, which request was complied with so far as the limited time at their disposal would allow.

TEACHING AND DEMONSTRATION WORK.

Macdonald Institute Classes.—A series of twenty-four lectures on floriculture was given by me to the ladies' class taking the horticultural option in both the fall and winter term classes, in all about fifty lectures. Practical

demonstrations were given with most of these lectures, the practice work in connection therewith being afterward carried out by the students themselves in the laboratory at the close of the lecture.

Second Year Students. The '06-7 class of second year students was the largest in the history of the College. Twenty lectures in all were given to this class of ninety students during the winter term, the lectures and practical work being along lines that would be useful in floriculture pertaining to the beautifying of the home.

Fourth Year Students. Sixteen lectures with a large amount of laboratory and practical work in advanced features of floriculture both from an amateur and commercial standpoint were given to those students specializing in horticulture. There is a growing demand for a more extended course of instruction in commercial floriculture by our students.

Nature Study Classes. Fourteen lectures with as many demonstrations and as much practical laboratory work as possible were given the classes in Nature Study. Much interest was shown in the work, more especially in the practical propagation of plants, bulb culture, and out-door gardening.

Outside Lectures.

In addition to lectures to students, I have delivered lectures on different phases of floriculture to various Horticultural Society meetings throughout the Province at the following places:—Toronto, Owen Sound, Stratford, Grimsby, Woodstock, Tillsonburg, and Port Dover, and at the Marden Women's Institute. At most of these places I addressed gatherings of school children at the schools in the afternoon. This latter feature of the outside work is one of the most pleasing—and I believe profitable—features in connection with my lecture trips.

Judging at Horticultural Societies' Exhibits and Fall Fairs.

During the past year I acted as judge at the annual exhibits of the Fergus, Owen Sound, Stratford, Elmira, St. Catharines, Tillsonburg, Elora, Galt, and Brantford Horticultural Societies, as well as at the Guelph Central and North Grey (Owen Sound) Fairs. The floral exhibits made by school children at many of these shows was the most appreciated feature of the exhibits.

Numerous articles on floriculture have been contributed throughout the year to horticultural and other papers, a large number of questions have been answered both in periodicals and through the mail. The main idea in connection with all of the foregoing phases of educational work has been to give such information and instruction as would be helpful in making the home surroundings what they should be, bright and cheerful.

The Greenhouses.

The largely increased number of students and classes taking up floriculture have taxed the two greenhouses now devoted to floriculture to their utmost limit. It is found necessary each year to devote more space to laboratory work, and to growing plants more particularly suited for class instruction and practical work by the students. This leaves very little room for experiments and tests except along amateur lines.

Fumigation with Cyanide of Potassium for White Fly.

The recent visitation of the insect known as the White Fly (*Aleyrodes vaporariorum*) in the greenhouses gave a good opportunity for tests for the eradication of this pest. This fly has caused much trouble, and often serious loss to all kinds of greenhouse plant growth—whether of vegetables or flowers—throughout the Province during the past three or four years. The adult fly is easily recognized not only by its minuteness but by its pure white shining appearance. The mature fly as well as the eggs and pupa are found on the under side of the foliage. It increases very rapidly, and is particularly fond of Salvia, Ageratum, Pelargonium, Geranium, and many other window and greenhouse plants. Fumigating or spraying the plants with nicotine preparations or with soap or kerosene emulsion have no decided effect upon it. Fumigating with cyanide of potassium seems to be the only thorough and effective means of exterminating the White Fly. As the fumes of cyanide of potassium are very deadly in their character to all animal life, great care must be taken by those using the cyanide not to inhale any of them. Cyanide should be used only in greenhouses and is not safe to use in the home of the amateur flower grower. Very varied results have been obtained in the use of this chemical, oftentimes owing to the varied strength of the cyanide itself. The most satisfactory results were obtained by using the ninety-nine per cent. chemically pure cyanide, as the ordinary or more crude cyanide varies so much in strength. Weather, atmospheric conditions, temperature and sunlight, tight or dilapidated greenhouses, all have more or less influence on results in using cyanide. The length of time the plants are exposed to the fumes is another important factor in results. In various tests made it has been found that it is not possible to use the cyanide of sufficient strength to destroy the eggs and pupa of the fly without injuring more or less some kinds of plant growth.

The Pine Apple Salvia, *Pilea microphylla*, (Artillery Plant), Tradescantia zebrina, Ageratum, and very young tender seedlings are some of the plants that are most readily injured by fumigating with the cyanide, with even very light fumigations. The plants mentioned should be removed from the greenhouse before fumigating operations begin. The green Tradescantia appears to be more resistant to the fumes than the dark leaved varieties, as in several tests the green variety was uninjured. Many other greenhouse plants, such as ferns, palms, and even pelargoniums, geraniums, and fuchsias, in full flower have not been injured in the slightest by light fumigations that have proved fatal to all of the mature or adult flies.

The following quantities of cyanide of potassium, sulphuric acid, and water to every one thousand cubic feet of greenhouse space have been found effective in killing the adult or mature fly under ordinary greenhouse conditions, without injury to plants save those mentioned. —

¼ ounce of chemically pure (99% pure) cyanide of potassium.
½ " sulphuric acid.
1 " water.

The following are the main points to be taken into consideration before starting to fumigate: —

1. Measure the greenhouses to ascertain the cubic feet of space in each house, and the quantity of materials required for each.

2. Make the houses as air-tight as possible by closing ventilators and other apertures, except the door for exit, leave the latter partly open until fumigation begins.

3. Fumigate late in the evening just before darkness sets in and when there are no strong winds prevailing.

4. Never fumigate in bright sunlight.

5. Temperature of greenhouse should not be over 60°F.

6. Provide sufficient suitable dishes in which to combine the chemicals. Flat, glazed, earthenware jars about six inches deep and eight inches in diameter are best for the purpose. Iron or tin dishes should not be used.

7. Carefully measure out the ingredients necessary for each jar to be used. For convenience in handling, the cyanide for each jar should be put into a small paper bag.

Method of Using. Place the jars on the walks in the house not more than fifty feet apart, to insure equal distribution of the fumes. Pour into each jar the quantity of water and acid required, dividing equally the materials required for the whole house among the number of jars used in it. Then begin at the jar farthest from the door and empty into it the cyanide, as previously measured out. Get away from it as quickly as possible, being careful not to inhale any of the fumes that begin at once to rise. If more than one jar is used treat the others in like manner as quickly as possible, and then get out of the house, close the door, and keep out until the next morning when the fumes will have become more or less dissipated. As a precaution, however, the doors should be opened for a few minutes in the morning to allow the fumes left to escape before anyone enters the house. Any cyanide left undissolved in the jars should be buried, as it is of no use again for fumigation purposes and it is dangerous to leave it lying around. Cyanide of potassium should be kept closely sealed in glass or glazed jars to prevent evaporation and loss of strength. Both the cyanide and the sulphuric acid should be kept out of reach of children or animals, and the jars or bottles in which they are kept should be labelled "Poison."

A number of tests were made with smaller quantities of chemicals than those mentioned, but with unsatisfactory results. Larger quantities with less time of exposure to plants were also tried with unsatisfactory results. In one test where double the quantity of chemical was used with a twenty-minute exposure, it was found that after a few hours many of the flies which appeared dead at first had recovered from the effects of the fumes and were quite lively, and some of the more resistant or hardy plants were slightly injured. The most satisfactory results on several occasions have been with the formula given and an all-night exposure. To entirely rid a greenhouse of these little pests, it will be found necessary to give three or four fumigations, about eight or ten days apart. The first fumigation destroys the adult fly and the second and successive fumigations the young ones that develop from the pupa and eggs which are unaffected by the fumigation.

Fumigations with cyanide of potassium are not effective on the Green Aphis, Black Aphis, Red Spider, Mealy Bug, Thrip or Scale. Fumigating with Aphis Punk we have found to be the most effective and cheapest means of exterminating the Green and Black Aphis.

Amateur flower growers who cannot fumigate their plants with cyanide may, to a large extent, prevent attacks of the White Fly by syringing or spraying the under side of the foliage with soapy water once or twice a week, and when the plants are nearly dry dust them with finely powdered flour of sulphur, wood ashes, or soot. The applications must be made to the under side of the foliage to be effective.

The Flower Beds and Borders.

The perennial, or, to be more strictly accurate, the mixed border stocked with permanent plants suitable for the farm or city flower garden was a source of much interest and attraction during the June excursions and throughout the summer season. Many new varieties, hybrids, and species, have been added to this border during the last few years. It is very evident from the interest shown that this feature of flower gardening is rapidly becoming more popular. A little bulletin on "The Mixed Flower Border" has been prepared, giving information as to the best species and varieties as well as hints on their care and culture. Copies can be had at any time on application to Prof. H. L. Hutt, Horticultural Department, Ontario Agricultural College, Guelph.

The Annual Border.

Upwards of eighty varieties of annuals were tested in the annual border this season. This feature of floriculture is of great benefit to students and visitors, giving an opportunity as it does of comparing closely the merits or demerits of different varieties, as well as being useful for purposes of identification. Some good object lessons could also be seen in several species as to the necessity for careful selection of seeds. In some instances plots gave very desirable results whilst other plots of the same variety sown with seed from a different source produced flowers of very inferior quality, often not worth growing.

Among the many varieties of annuals tested were some promising new ones which showed signs of being valuable acquisitions to the list of these popular summer flowers. The new annual Sweet William—a hybrid between the China Pink and the ordinary Sweet William—gives promise of being a very useful addition to this class of plants. Plants from seed grown on May 22nd in the open border were in flower the second week in July and flowered continuously until after the first early frosts. The ever-blooming Sweet William sown on the same date gave equally good results. The new type of Nigella or Love in a Mist (Miss Jekyll) is also a decided advance on the original type of this old-fashioned favorite. Zinnia elegans, Lilliput, or Dwarf Zinnia, growing to a height of about twelve inches with much smaller flowers and less coarse than the old type of Zinnia will prove useful for a flower bed or for sowing in clumps or groups in the border. The Annual Chrysanthemum (Yellow Marguerite) "Evening Star," is a very floriferous annual, its pale yellow flowers being much appreciated during the early part of the summer. Schizanthus Wisetonenis (Butterfly Flower) is a great advance on the old type of these flowers, its delicately formed sprays are very graceful and enduring for cut flower purposes. The annual Gypsophilla is deserving of more general cultivation because of its continuous and free flowering habit and also because of its value in cut flower work. The plumed varieties of Celosia (Coxcomb), both the crimson and golden, are very useful for decorative purposes in the border or as cut flowers.

Owing to the late season the annuals could not be sown this year until about the third week in May. Usually about the first week in May is the best time to sow most annuals out of doors for early bloom. Later sown annuals, sown in the mixed border often give a wealth of blossoms at a time when many of the perennials are past blooming and begin to look shabby.

Rose Test. About one hundred and forty varieties of roses representing the different types were planted last spring, in order to determine what

are the hardiest and best kinds for the amateur. Tests of the best methods of winter protection will be made during the present winter, and tests of cultural methods and various kinds of insecticides will also be made upon them next season.

Pæony Test. One hundred plants of these increasingly popular summer flowers were planted this fall. The Pæony is rapidly coming to the front as one of the main summer flowers for commercial and amateur culture. We hope soon to include in our collection all of the best known varieties.

Continued selections were made this year with Chrysanthemums, Gladioli, and seeding geraniums, the latter being the result of cross fertilization work done by students upon a number of the standard varieties of geraniums. Several of these seedling varieties promise to be of unusual merit, but these will have to be still further tested before their value can be definitely determined.

LANDSCAPE GARDENING AND RURAL ART.

There never was a time in the history of this country when so much interest has been manifested in the ornamental or aesthetic side of horticulture—what might be called landscape gardening and rural art. It is quite natural, however, that as the country becomes settled, and particularly in times of prosperity such as we have enjoyed of late years, that the people should give more thought to the improvement and beautifying of their surroundings. Such desires and aspirations deserve all the encouragement we can give, for they tend to the general improvement and uplift of our people.

Educational Agencies at Work.

There are a number of educational agencies at work in this Province promoting an interest in rural art and civic improvement. Among the most active of these is the Ontario Horticultural Association, with which is affiliated sixty-six local horticultural societies in various parts of the Province. The enthusiasm shown at the second annual meeting of this Association recently held in Toronto was good evidence that it is going to exert a powerful influence for good throughout the country.

The press, too, is taking a more lively interest than ever in such matters, and is proving a strong factor in advancing this desirable work. At the request of the *Farmers' Advocate*, we contributed a series of four articles last spring on "The Improvement of Rural Home Surroundings," which has lead to a number of inquiries for more information on the same subject.

Beautifying of School Grounds.

In our opinion one of the most effective means of creating a love for the beautiful would be to educate the rising generation by beautifying the school grounds of the Province. If the school grounds were made beautiful with trees, shrubs, vines and flowers, the effect would be far-reaching in its influence, not only with the rising, but with the present generation.

Already many school boards, both in town and country, are taking an interest in this matter and are making progress. At the request of the Board of Education, I prepared plans last summer for the beautifying of the Guelph Collegiate Institute grounds. The improvements suggested were undertaken at once, and much work has been done in grading and preparing the grounds for the seeding and planting which will be done next spring. Plans were

also suggested for the improvement of a block of twenty acres in the town of Morrisburg in Dundas County, which is now used as High School grounds and is intended as well for a town park.

From correspondence we have had this year with school inspectors, teachers, and trustees, we believe there is a strong desire for such improvement and the introduction of school gardens in many sections of this country. We trust that before long our department here may be so organized that more attention may be given to this important work.

Civic Improvement.

Wherever citizens become alive to the importance of beautifying private grounds, the interest soon spreads to the improvement of streets and boulevards, and to the establishment of parks and improvement of public grounds. In a number of Ontario towns and cities, Park Commissions have been appointed which give greater continuity and permanency to the work of improvement.

At the request of the Parks Committee of the Guelph City Council, I have assisted during the year in planning for the improvement of the new Lyons Park donated to the city. Such improvements pay well in any community not only in providing healthful recreation and comfort for the people, but in advertising it as a desirable place for others to locate.

The College Grounds.

There can be no doubt that our spacious lawns and well kept grounds at the College, which are visited by thousands of visitors every year, have had a wide influence in creating a desire for improvement in private and public grounds throughout the country.

These grounds were originally laid out by a prominent American landscape architect, and while they may be considered too extensive to be imitated by private property owners, yet as we point out to our students, the same principles in grouping and planting adopted here may be taken as a guide in beautifying rural homes where the grounds need not be so extensive.

With the many new buildings which have been added here from time to time, the grounds have been enlarged and altered. Most of the permanent improvement made this year was in grading and laying out the grounds about the new Mechanical Building.

As foreman in this branch of the work, we are fortunate in having such a man as Wm. Squirrell, who has been here for thirty-three years. To him is due much of the credit for the neat and tidy condition of the grounds.

Instruction in Rural Art.

Instruction on landscape gardening as applied to the beautifying of rural and urban homes has been given to students of the Macdonald Institute, sophomore and senior years of the College.

A number of lectures on various phases of the subject have also been given during the year to Horticultural Societies throughout the Province.

Respectfully submitted,

H. L. HUTT.

PART XII.

THE PROFESSOR OF ANIMAL HUSBANDRY AND FARM SUPERINTENDENT.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit the report of my department.

During the year, my assistant, Mr. H. S. Arkell, resigned to accept the position of Professor of Animal Husbandry at the Macdonald College, Ste. Anne de Bellevue, Que. The loss of Mr. Arkell has been a serious one, as he had become thoroughly acquainted with the work of the department, and was doing exceptionally good work. We were very fortunate, however, in securing Mr. R. W. Wade as his successor. Mr. Wade is a strong man, and we believe that the effiicency of the Department will be fully maintained.

As in previous years, teaching in the College, attending Farmers' Institute meetings, stock judging classes, etc., directing the management of the farm and the experiments with live stock, and attending to many other matters, have combined to fully occupy my time. A detailed report of a great part of this work would not be of general interest, and, therefore, only those matters of greatest interest to farmers will be discussed.

FARM CROPS.

The past season, which has been so disastrous in many parts of the Province, gave us very fair crops. The cold weather of May interfered to some extent with the hay crop, which was not quite so heavy as usual, though it yielded close to two tons per acre. The fall wheat was a tremendous crop as regards straw, but a good deal of it lodged, which materially affected the sample and the yield. It is not all threshed, but will yield between thirty and forty bushels per acre. Oats were lighter in the straw than usual, and stood up well, which is an unusual thing for this farm. The sample is better than we have had for a number of years, and the yield will be at least fifty bushels per acre, though threshing is not completed. The barley was an exceptionally even crop, and should give a yield quite up to other years, though very little of it has been threshed. The root crop was quite satisfactory. Mangels are not quite so large as usual, but yielded about eight hundred bushels per acre, and turnips yielded seven hundred bushels per acre. The dry weather of July and August affected the yield of potatoes, which hardly reached one hundred and twenty bushels per acre. There was practically no rot among the potatoes this year. Silage corn was a very even crop, and yielded about fifteen tons per acre.

INVESTIGATIONS WITH SWINE.

The primary object in feeding live stock on the average farm is to furnish a profitable market for the products of the farm. The great advantage in feeding animals as a means of marketing farm products rests in the fact that the farmer is generally able to sell his grain, etc., in the form of animal products at prices which give him a fair profit above the cost of production, and to retain upon his farm a large part of the fertilizing value of his crops. This fertilizer increases the yield of subsequent crops, and by increasing the yield,

reduces the cost of production. Even though he may sometimes realize slightly less than prevailing market prices for his crops, the fact that he produces his crops at a lower cost, gives him a larger profit than the man who sells his produce without feeding it to stock.

In another place will be found a discussion of prices realized for feed consumed by fattening steers, and this investigation deals with prices realized for feed consumed by fattening hogs.

Scope of the Investigation.

Part of the hogs employed in this investigation were fed at the College, and the remainder were fed by farmers in different parts of the Province, in the co-operative experiments rendered possible by the liberality of the Wm. Davies Co., of Toronto. The investigation takes in two hundred and ninety-seven hogs, weighing, when marketed, fifty-six thousand seven hundred and eighteen (56,718) pounds, or an average of 190.9 pounds each. Reliable figures from such a large number of hogs, fed under different conditions and at different seasons of the year, should prove instructive, and they are the only figures of the kind of which I have any knowledge. It may be added that two lots of hogs, which were fed under exceptional conditions, and consumed a very small amount of marketable food in consequence, have been omitted from the calculation. If they were included, the results would be still more favorable.

The following summary gives a clear idea of the scope of the investigation:

Number of hogs	297	
Weight when marketed	56,718	lbs.
Average weight per hog	190.9	"
Total meal consumed, including middlings and bran	165,911	"
Total skim-milk consumed	112,500	"
Total roots consumed	64,600	"
Miscellaneous foods, such as pasture, green foods, etc., valued by experimenters at	$77.00	

Method of Calculating Results.

The quantities of feed described above were consumed by the pigs after the time they were weaned. It becomes necessary, therefore, to assign a value to the pigs at weaning time. Since we assume that we are dealing with pigs raised by the man who fattened them, it is only fair that the pigs should be valued at what they cost at the time of weaning. In our experiments, as reported last year, the average cost of raising young pigs from birth to weaning, including service fee and cost of maintaining sow, was $1.27 each. Lest this amount may be considered too low, we are charging the pigs used in these experiments at $1.50 each, which should represent the maximum cost.

In the table which follows, it is assumed that the pigs are sold at prices varying from 4½ cents to 6½ cents per pound, live weight, and the prices obtained for food actually consumed are reckoned on the basis of each selling price.

The cost of the pigs when weaned ($1.50 each), the charges for miscellaneous foods amounting to $77.00, the value of the roots at 10 cents per bushel, and the skim-milk at 20 cents per hundredweight, are first deducted from the total proceeds in each case, and the residue represents the cash received for meal consumed by the hogs. The term meal includes middlings and bran.

The following table shows the prices obtained for feed under each valuation of the hogs when sold:

PRICES REALIZED FOR FOODS CONSUMED BY 297 HOGS.

Assumed selling prices of hogs, live weight.	Meal, including middlings and bran.	Milk.	Roots.
If sold at 4½ cents per lb.....	$20.45 per ton.....	20 cents per cwt.	10 cents per bu.
" 5 " "	$23.87 "	20 " "	10 " "
" 5½ " "	$27.29 "	20 " "	10 " "
" 6 " "	$30.71 "	20 " "	10 " "
" 6½ " "	$34.13 "	20 " "	10 " "

Comments.

1. The results shown in the table mean, that after deducting the cost of the pigs at weaning time, and the charges for miscellaneous foods, the farmer would receive the prices indicated in the table for the foods consumed by the hogs. The prices received for foods vary, of course, with the price at which the hogs were sold. No charge is made for labor, and no credit is given for manure.

2. The kinds of meal used in feeding these hogs comprise barley, peas, oats, corn, middlings, and bran.

3. It has been necessary to group all kinds of meal together, owing to the fact that many of the experimenters could not give exact quantities of each kind of meal, and simply furnished total weight of mixtures.

4. Comparing the prices obtained for feed in these experiments, with prevailing market prices for feed in ordinary years, we must admit that even if sold at 4½ cents per pound, these hogs would return fair values for feed consumed, and at 5 cents per pound they would return more than ordinary market prices for feed consumed.

5. It is not often that hogs have sold at less than 5 cents per pound during late years, and since the usual price for hogs has been considerably above 5 cents per pound, we must conclude that selling farm products in the form of finished hogs is generally a profitable method of disposing of them.

6. While it is a bad thing for a farmer to be overstocked with hogs, yet there is an important place for hogs upon most farms, and especially upon those farms where dairy by-products are available.

FATTENING STEERS FOR EXPORT.

SHORT KEEP *vs.* LONG KEEP STEERS.

The terms *short keep* and *long keep* as applied to steers are not exactly definite, that is to say, it is somewhat difficult to draw the line between the two classes of steers, as they merge gradually one into the other. Generally speaking, however, short keep steers are heavy, fleshy steers, which can be finished for export with two or three months of stall feeding, while long keep steers are lighter and thinner, and may require five or six months of feeding in order to finish them.

Plan of Experiment. This experiment is a continuation of last year's work, and the aim is to secure data regarding the relative value of short keep and long keep steers. Eight steers were employed in each group, and par-

ticulars regarding the weights, etc., of each group will be found in the table which follows. The meal ration comprised barley, oats and bran, and while there was some variation in the proportions of these foods, the approximate proportions for the short keep steers were about two parts barley to one part each of oats and bran by weight. For the long keep steers a much larger proportion of bran was used at the start. The bulky fodder consisted of a mixture of one part cut hay, two parts pulped roots, and two parts silage by weight.

The short keep steers were started on about five pounds of meal each per day, which quantity was increased as rapidly as deemed safe until it reached about ten pounds of meal per steer per day. On the average, the steers consumed .632 pounds (not quite 2-3 of a pound) of meal per day per 100 pounds of their average live weight.

The long keep steers were started on about four pounds of meal each per day and increased very gradually. On an average, they consumed .524 pounds (a little over ½ pound) of meal per day per 100 pounds of their average live weight.

Valuation of Foods. For purposes of comparison, the same values were attached to foods consumed as were employed last year. To be sure, they are a great deal lower than prices prevailing at the present, but it must be remembered that the experiment was conducted during the winter of 1906-07, when prices for feedstuffs were much lower. In any case, it does not much matter whether the values used are high or low, as they answer the purpose of comparing the two classes of steers, which is the only object sought in the experiment. The values attached to food used are as follows: Meal, including bran, $20.00 per ton; hay, $8.00 per ton; roots, $2.00 per ton; silage, $2.00 per ton.

The following table gives general details of results:

TABLE SHOWING WEIGHTS, GAINS, FOOD CONSUMED, COST OF GAIN, ETC.

	Group I. 8 Steers. Short Keep.	Group II. 8 Steers. Long Keep.
Average weight of steers at commencement of experiment	1279.3 lbs.	1160.3 lbs.
Average weight of steers at close of experiment	1431.9 lbs.	1405.6 lbs.
	In 69 days	In 126 days
Average gain per steer	152.6 lbs.	245.3 lbs.
Average daily gain per steer	2.21 lbs.	1.95 lbs.
Food consumed	Meal — 4,730 lbs.	Meal — 6,780 lbs.
	Hay — 5,000 "	Hay — 9,325 "
	Roots—10,000 "	Roots—18,625 "
	Silage—10,070 "	Silage—18,625 "
Value of food	$87.37	$142.36
Cost of 1 lb. increase in weight	7.15c.	7.25c.
Average meal consumed per day per 100 lbs. average live weight of steers	.632 lbs.	.524 lb.

Relative Value of the Two Groups. The table given above contains details which may be of general interest, but it does not touch the point at issue in the experiment, viz., the relative values of the two classes of steers used in the experiment. To arrive at this point, it will be necessary to affix arbitrary values to one group of steers, ascertain, by using these values, what prices were obtained for the food consumed, and from these data ascertain what could have been paid for the steers in the other group in order that they might be sold at the same price per pound, and return the same values for food consumel.

Suppose, therefore, that the long keep steers are valued at 4 cents per pound when purchased, and at 5 cents per pound when sold. This valuation gives a "spread" between the buying and selling price of only one cent per pound, which is a smaller "spread" than most feeders are satisfied with. Attaching these values we get the following:

Cost price 8 long keep steers, 9,282 lbs. at 4c.....	$371 28
Selling price 8 long keep steers, 11,245 lbs. at 5c.....	562 25
Money received for feed consumed.....	$190 97

That is to say, the total feed consumed by these eight long keep steers was sold for $190.97. Now, let us see what price per bushel, or per ton, was received for the feed. Approximately, the prices were as follows:

Barley	2,420	lbs. at	60c.	per bu.	= $30.25
Oats	1,530	"	42½c.	per bu.	= 19.12
Bran	2,830	"	$25.00	per ton	= 35.37
Hay	9,325	"	$12.00	per ton	= 55.95
Roots	18,625	"	10c.	per bu.	= 31.04
Silage	18,625	"	$2.00	per ton	= 18.63
Total					$190.36

This total is a few cents short of what was actually received for the feed consumed by the steers, but it may be regarded as practically correct. It will be noted, therefore, that by buying these steers at four cents per pound, and selling them at five cents per pound, the feed they consumed was sold at the following prices: Barley, 60c. per bu.; oats, 42½c. per bu.; bran, $25.00 per ton; hay, $12.00 per ton; roots, 10c. per bu.; silage, $2.00 per ton. The prices realized for feed are considerably above average market prices in this province, and the farmer who marketed his products at the prices realized in this experiment, should have a substantial profit.

Now, let us see what we could have paid for short keep steers, so that we could sell them at the same price per pound (5c.) as the long keep steers, and realize the same prices for feed. The problem works out as follows, the cost of feed actually consumed by this group being first ascertained:

Barley	2,300	lbs. at	60c.	per bu.	= $28.75
Oats	1,260	"	42½c.	per bu.	= 15.75
Bran	1,170	"	$25.00	per ton	= 14.62
Hay	5,000	"	$12.00	per ton	= 30.00
Roots	10,000	"	10c.	per bu.	= 16.66
Silage	10,070	"	$2.00	per ton	= 10.07
Total					$115.85

Selling price, 8 short keep steers, 11,457 lbs. at 5c.....	$572 85
Value of feed at prices realized in long keep group	115 85
Price which could have been paid for short keep steers to realize same prices for feed as realized in long keep groups	$457 00
Weight of short keep steers when purchased, 10,235 lbs.	
Price per cwt. which could have been paid for short keep steers to get same results as with long keep	$4 46

That is to say, buying the short keep steers at $4.46 per cwt. and selling them at $5.00 per cwt., would return the same values for food consumed as would be obtained by buying the long keep steers at $4.00 per cwt. and

selling them at $5.00 per cwt. In other words, if the long keep steers were worth $4.00 per cwt. to buy as feeders, the short keep steers were worth $4.46 per cwt. to buy as feeders.

Notes on Experiment.

1. A peculiar feature of this experiment is the fact that the short keep steers made slightly cheaper gains than the long keep. As a rule, the long keep steers make cheaper gains.

2. The slight difference in cost of gain had very little to do with the superior showing made by the short keep steers. The main factors in determining the value of these two groups, were the heavier weights and higher condition of the short keep steers at the time of purchase. For a full discussion of the influence of these two factors in steer feeding, see Annual Report of the College for 1906, page 160.

3. In the case of the steers used in this experiment, the short keep steers were worth 46c. per cwt. more than the long keep steers, to buy as feeders. It will be noted, however, that the long keep steers averaged 1,160 pounds each at the commencement of the experiment, and required feeding only 126 days. In weight and condition, therefore, they were above the general run of long keep steers, and had they been lighter at the commencement, the difference in favor of the short keep steers would have been greater.

4. The lighter and thinner the steer, the less he is worth per pound to buy as a feeder.

5. In calculating the prices received for feed consumed by the steers no charge has been made for labor, and no credit given for manure.

Feeding Steers Loose *vs.* Tied.

In this comparison, the tied steers are represented by the eight short keep steers employed in the experiment just described. In comparison with these, we fed four short keep steers in a loose box. These steers had been dehorned before they were purchased.

The method of feeding, and the foods employed, were the same as in the case of the short keep steers already described, and the values attached to the foods for purposes of comparison, are the same as those employed in the experiment with short keep and long keep steers.

The following table gives the principal facts in connection with the experiment:

Table Showing Weights, Gains, Food Consumed, Cost, etc.

	Group I. 8 Steers. Tied.	Group II. 4 Steers. Loose.
Average weight per steer at commencement of experiment	1279.3 lbs.	1258 lbs.
Average weight per steer at close of experiment	1431.9 lbs.	1439.2 lbs.
Average gain per steer in 69 days	152.6 lbs.	181.2 lbs.
Average daily gain per steer	2.21 lbs.	2.62 lbs.
Food consumed	Meal — 4,730 lbs. Hay — 5,000 " Roots—10,000 " Silage—10,070 "	Meal —2,520 lbs. Hay —2,825 " Roots—5,650 " Silage—5,650 "
Value of food	$87.37	$47.80
Cost of 1 lb. increase in weight	7.15c.	6.59c.
Average meal consumed per day per 100 lbs. average live weight of steers	.632 lb.	.677 lb.

Notes on Experiments.

1. The loose steers made larger gains and cheaper gains than the tied steers.
2. The loose steers consumed more meal in proportion to their live weight than the tied steers, and apparently made better use of what they consumed.
3. The loose steers always had good appetites, and were not so easily put off their feed as the tied steers.
4. The results this year are in harmony with last year's results, but the experiment is being repeated.

Live Stock.

During the year, some additions have been made to our live stock equipment, with a view to increasing its usefulness for educational purposes. Last spring, a four-year-old imported Clydesdale mare was purchased. We now have three pure-bred Clydesdale mares, which is not a large number, but about all we can handle with our present accommodation. We also have on hand the yearling son of "Her Pretty Sel," 8976, and a colt foal out of "Princess Maude," [2282] 11192.

Summer visitors inspecting the beef breeds of cattle at the Ontario Agricultural College, Guelph.

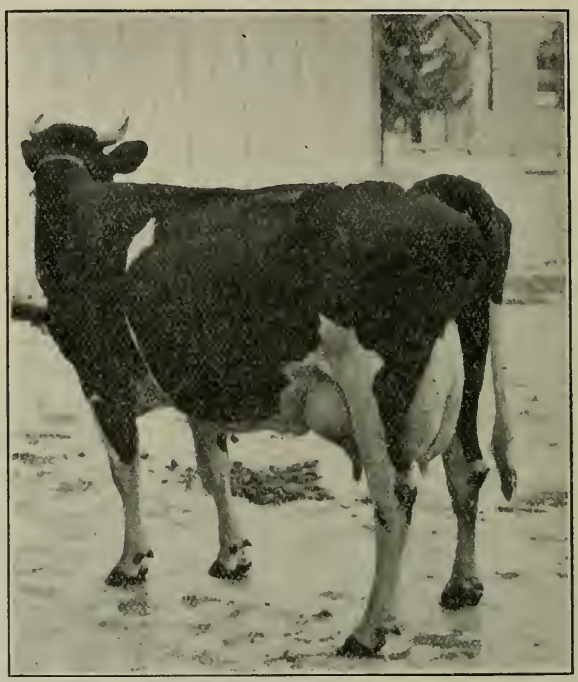
At the special request of Prof. Dean, the Farm department took over the herd of dairy cattle on January 1st of this year. During the year there have been added to the dairy herd five Ayrshire cows, three of which were imported; one imported Ayrshire bull, and four Jersey cows. These additions have greatly strengthened the herd for class room purposes.

A Remarkable Milk Record.

In his annual report for 1906, Prof. Dean refers to the Holstein cow, Boutsje Q. Pietertje De Kol, 6093, C.H.F.H.B. This cow dropped her second

calf on October 26th, 1906. As she is not due to calve again until next spring, she has had an exceptional opportunity to make a record, but her record is, nevertheless, remarkable. It is as follows:

Record for	1	day,	96	lbs.	milk.					
"	7	days,	643	"						
"	30	"	2,522	"	88.27	lbs.	fat=	103	lbs.	butter.
"	365	"	20,778	"	781.91	"		912.22	"	



Holstein Cow, Boutsje Q. Pietertje De Kol, 6093, C.H.F.H.B. Owned by Ontario Agricultural College.

During the week she made her highest record, she was fed a heavy meal ration, the heaviest meal ration for one day being one pound gluten feed, three pounds oil cake, three pounds cornmeal, and about nineteen pounds of a mixture of bran and mixed meal. In addition, she was fed mangels, corn silage, and mixed clover and timothy hay. As we did not wish to risk injuring the cow, the quantity of meal was reduced to about fourteen pounds per day, and her average meal ration from the time of calving until going out to pasture in the spring, was about fifteen pounds per day. While on pasture, she was fed about five pounds of meal per day, and since coming into the stable this fall, she has been fed ten pounds of meal per day.

The Dairy Herd.

The bulky ration for the general herd is the same as that previously mentioned as fed to "Boutsje." The quantity varies with individuals, but will average about forty pounds mangels, thirty pounds silage, and about fifteen pounds hay to each cow per day. Cows in full milk receive from eight pounds to ten pounds of meal each per day depending upon the productiveness of

the cow. Cows well advanced in lactation, and dry cows receive proportionately less, the quantity being governed by the condition and apparent requirements of the cow. Generally, the bulk of our meal ration consists of ground oats and bran, but this winter, owing to the high price of oats, we are feeding a mixture of bran and "Molac," a preparation obtained from the "Quaker Oats" people of Peterborough.

RECORD OF DAIRY HERD FROM DECEMBER 1ST, 1906, TO NOVEMBER 30TH, 1907.

Name of Cow.	Breed.	Age Dec. 1, 1906.	No. of days milking.	Lbs. of milk.	Average per cent. of fat.	Lbs. of fat in milk.	Lbs. of butter, adding $\frac{1}{8}$ to fat.	Value of fat at 25c. per lb.	Cost of feed.	Profit over cost of feed.
								$ c.	$ c.	$ c.
Boutsje	Holstein	4	365	19,064	3.76	716.64	836.08	179.16	69.40	109.76
Adelaide	"	9	257	11,806	3.7	441.19	514.72	110.29	48.28	62.01
Margaret Cornelius	"	9	343	12,283	3.4	416.76	486.22	104.19	49.28	54.91
Molly De Kol	"	5	298	10,880	3.4	380.49	443.9	95.12	41.92	53.20
Abby Mercena	"	6	267	9,979	3.8	379.75	443.04	94.93	43.45	51.48
Lady Springwood II	Holstein Grade.	3	344	10,519	3.4	357.82	417.46	89.95	45.04	44.91
Lady Rockwood, O.A.C.	Holstein	4	308	9,722	3 5	340.09	397 7	85.02	39.82	45.20
Marjorie Cornelius	"	3	338	9,372	3.4	317.39	370.38	79.34	42.81	36.53
Inka Mercedes	"	7	334	10,172	3.06	312.14	364 16	78.03	47.47	30.56
Glennie, O.A.C	Ayrshire	3	308	7,283	4.1	302.00	352.3	75.50	37.40	38.10
Lady Nancie 2nd	"	6	365	6,940	4.1	285.15	332.67	71.28	37.65	33.63
Molly	Holstein Grade.	5	211	7,494	3.6	273.34	318.89	61.84	37.04	24.80
Toitilla	Holstein	5	225	7,442	3.4	253.64	295.91	63.41	39.81	23.60
Beauty, O.A.C	"	2	295	7,578	3.17	240.23	280.27	60.06	33.57	26.49
Mercena Netherland	"	2	308	7,574	3.06	231.82	270.45	57.95	40.51	17.44
Nero's Lass	Jersey	6	252	5,263	4.3	226.81	264.61	56.70	32.53	24.17
Average of 16 cows			301	9,585	3.58	342.2	399.2	85.55	42.87	42.30

NOTES ON HERD RECORD.

1. Only cows which have completed, or nearly completed, a year's milking in the herd are included in the table. A number of cows have been purchased during the year, and have been milking only a few months while in our possession. These have been omitted from the table, as there would be nothing gained by reporting their performance for a few months. They will be included in next year's report.

2. It will be noted that Boutsje's record as shown in the table is not equal to her record as reported elsewhere. This discrepancy arises from the fact that our yearly record for the herd commences on December 1st and closes November 30th. Boutsje freshened October 26th, 1906, and during November, 1906, she made her highest monthly record. Since our yearly report opens December 1st, 1906, it will be seen that her highest month is omitted from the totals shown in the table, and her lowest month, viz., November, 1907, takes its place. The table really shows what Boutsje produced in twelve months, omitting what she produced during her first month of lactation, and putting what she produced during her thirteenth month of lactation in its place.

3. To ascertain exactly the amount of feed consumed by each cow in a large herd, is a difficult matter. By occasional weighings, however, a reasonably close approximation of the food consumed by each cow can be obtained. The figures given in the table regarding the cost of feed are not claimed to be exact, and may vary a few dollars one way or the other on any one cow. At the same time, we feel sure that they are close enough to the truth to be instructive, and hence they are included. The variation from the exact cost cannot be more than a few dollars in any case, and it is quite probable that in some cases the cost of feed stated in the table is higher than it should be.

4. In affixing values to foods consumed, we have aimed to fix upon values that may be retained year after year for purposes of comparison, rather than to follow constantly fluctuating market values. The following values have been employed: Meal of all kinds, $20.00 per ton. Hay, $8.00 per ton. Roots and silage, each $2.00 per ton. Pasture, $1.00 per cow per month.

5. For a year like the present, these values are too low, but for a normal year, they are quite reasonable. Our meal mixture always comprises a large proportion of bran, and it is rarely that the cost of our meal ration exceeds $20.00 per ton. At the present time (January, 1908), the meal mixture we are feeding our cows costs us $22.75 per ton. An increase of 20 per cent. in the cost of feed as shown in the table would quite meet the extra demands of the present winter, and even with such an increase in the valuation of the feed, these sixteen cows would still show an average profit of $34.10 per head above the cost of feed.

6. It must be borne in mind that the figures given in the table relative to cost of feed, deal mainly with the winter of 1906-07, when feed was a good deal cheaper than at present.

7. We have an advantage in getting our bran at wholesale rates, but if farmers would co-operate, they could also obtain the same advantage.

Respectfully submitted,

G. E. DAY.

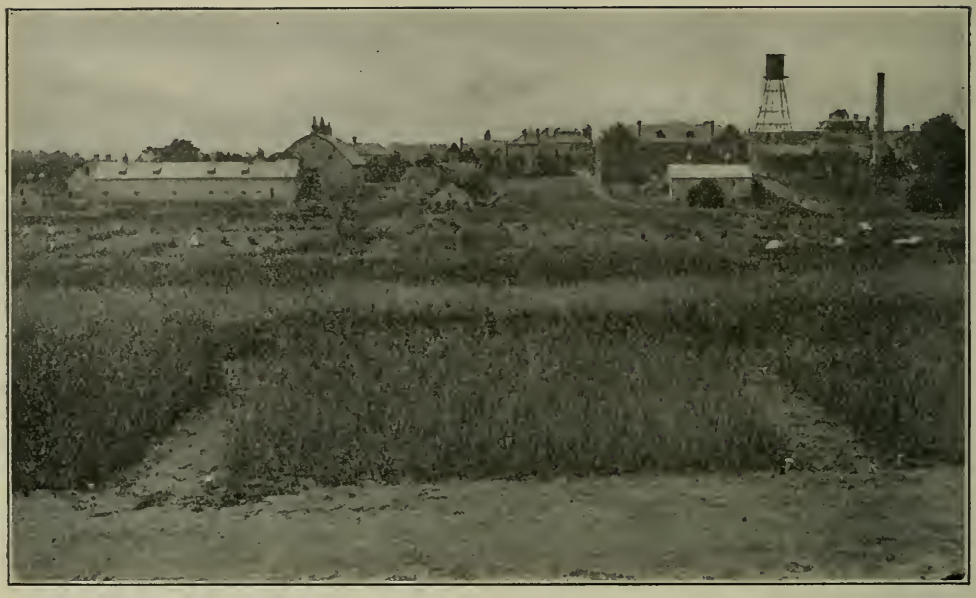
PART XIII.

THE PROFESSOR OF FIELD HUSBANDRY AND DIRECTOR OF FIELD EXPERIMENTS.

To the President of the Ontario Agricultural College:

SIR,—I have the honor of submitting herewith the report of the work done in the department of Field Husbandry for the year 1907. The work of giving instruction to students, of carrying on field experiments at the College, and of conducting co-operative field experiments throughout Ontario has been performed during the past year with a considerable amount of satisfaction to myself, and I trust to all concerned.

I take this opportunity of publicly and sincerely thanking yourself, the Minister of Agriculture, and the Government of Ontario for so kindly giving me a leave of absence during the year 1906. Although my salary was continued as usual, I used practically all of it in travelling some twenty-two thousand miles in the study of agricultural problems in various countries. It was my privilege to attend and address the International Convention on Hybridization and Plant Breeding, held in London, England; the Annual Meeting of the British Association on Agricultural Education, held at Glasgow, Scotland; the Annual Meeting of the American Breeders' Association, held at Lincoln, Nebraska; the Annual Meeting of the Corn Growers' Association, held at Manhattan, Kansas; the Farmers' Congress, held at Denver, Colorado, etc. I also thoroughly appreciated visiting the Royal Agricultural Show of England, held at Derby; the Highland and Agricultural Show, held at Peebles, Scotland; and the Royal Horticultural Show of England, held at London. A two weeks' stay at the University at Cambridge, England, and a shorter visit at the Agricultural College, Glasgow, the University at Edinburgh, the Rothamsted Experiment Station at Harpenden, and at several Agricultural Colleges in England gave an opportunity to study the agricultural work which is being conducted at these institutions. I spent about ten days, when in London, at the British Department of Agriculture, and about twenty days, when in Washington, at the Department of Agriculture of the United States. The people at the Departments of Agriculture and those at the various institutions visited gave me a hearty welcome and were exceedingly kind throughout. Besides visiting the various people and institutions, I thoroughly enjoyed seeing some of the noted farms in the Old Country; such as, those owned by King Edward VII at Windsor, by Lord Roseberry at Dalmeny, by the Garton Bros. of Warrington, by Jno. Speir near Glasgow, and by Mr. Bone in Ayrshire. With scarcely less enjoyment were the visits made to some of the ordinary farms of England, Jersey, and Guernsey, which were mostly reached by means of walks through a few of the many interesting rural districts. In order to thoroughly enjoy rural England, it certainly must be seen at leisure. Some of the most pleasant and profitable features of the year were the forming of new and the renewing of old acquaintances with some of the foremost men in agricultural science of the present day. I was entertained in the home of Luther Burbank, Santa Rosa, California; Professor Bateson, Grantchester, England; Professor Middleton, Cambridge; Robt. Garton, Warrington; Professor Bruce, Edinburgh; Sir Trevor Lawrence, Burford;



Plant breeding grain plots in the front, experimental plots in the centre and part of the College buildings in the rear.

View of the barn and partial view of the plots of the Experimental department.

Professor Biffen, Cambridge, etc., and I met at the conventions Professor Tschermak of Vienna, Professor Johannsen of Copenhagen, Professor Wittmack of Berlin, Professor Noorduijn of Groningen, Professor Pfitzer of Heidelberg, Professor Percival of Reading, England, Professor Wallace of the University of Edinburgh, Professor Hendrick of the University of Aberdeen, Professor Wilson of St. Andrews University, and very many others, whose acquaintances I prize very highly. By knowing these gentlemen personally, I hope to keep in close touch with their work of investigation and particularly in the study of heredity and its practical application to plant breeding.

During the past year, Mr. C. R. Klinck, a graduate of our College, was appointed to take the position in the department of Field Husbandry made vacant by the resignation of Mr. H. G. Bell, who left us to accept an appointment on the staff of the Agricultural College of Iowa. We also increased our force by the appointment of Mr. A. W. Mason, a graduate of 1905, and of Mr. R. W. Mills, a graduate of 1907. Owing to illness, Mr. Mills was compelled to stop work for a time and has not yet returned. Mr. J. Buchanan, lecturer in Field Husbandry, had charge of the department during my absence in 1906, and I wish to bear testimony to the efficient manner in which he performed the duties of the department, and also to the able assistance which he has rendered during the year just closing. I have been ably and cheerfully assisted, also, by Mr. W. J. Squirrell, a graduate of the College, by Mr. A. E. Whiteside, the foreman, and by Miss J. I. Coxon, the stenographer, all of whom have not only been faithful in the performance of their duties, but have manifested a deep interest in the work of the Department.

The duties of the department of Field Husbandry are certainly numerous, as can be imagined from a glance at the following outline of the work of the past year.

(1) The delivering of lectures and the giving of demonstrations in the class room, the laboratory, and the field, before the freshmen, the sophomore, and the senior classes in the regular College course, as outlined in the College Calendar; also before students taking the short course in stock and seed judging, those taking the dairy course, and those taking the nature study courses at the College and the Institute.

(2) The conducting of experiments in field agriculture on about 2,000 accurately measured plots at the Agricultural College.

(3) The improving of the leading varieties of barley, oats, winter wheat, spring wheat and field peas by means of systematic selection and of cross fertilization, there being about 17,000 hybrid plants grown separately in the experimental grounds in 1907.

(4) The directing of co-operative experiments on upwards of 4,000 farms throughout Ontario, the reports of which will be found in the annual report of the Ontario Agricultural and Experimental Union.

(5) The delivering of addresses by the writer at various gatherings of farmers and others throughout Ontario as follows: One before the Agricultural Committee of the Ontario Legislature, Parliament Buildings, Toronto; one before the Teachers' Convention of North Simcoe at Guelph; one at the Farmers' Picnic near Dunville in Welland County; one at the Canadian Institute, Toronto; one at the Canadian Club, Orillia; one before the Board of Trade at Guelph; one before the Women's Institute of South Wellington at Marden; one at the annual meeting of the Farmers' Institute of North Grey at Owen Sound; two at a special meeting of the Farmers' Institute of North Waterloo at Elmira; one at a Stock Breeders' Banquet at Guelph; one at the Rittenhouse School near Beamsville in Lincoln County;

one at the Macdonald Consolidated Rural School at Guelph; one in School Section No. 6 Guelph Township, and one in School Section No. 2 Puslinch Township; one at a meeting of a committee in connection with the farm crops competition in Ontario, held at the Canadian National Exhibition, Toronto; three at the annual meeting of the Ontario Agricultural and Experimental Union, Guelph; one at the session on seeds at the Provincial Winter Fair, Guelph; about twenty-five before the thousands of farmers who visited the College and the experimental grounds in the month of June. An address was also delivered at the annual meeting of the American Association of Farmers' Institute Workers, Washington, D.C.

(6) The writing of agricultural reports and articles, including the report of the Experimental department of the College and of the co-operative experimental work in agriculture throughout Ontario, and also the articles which are sent to the farm journals and newspapers throughout the year.

(7) The carrying on of a very large correspondence with farmers, seedsmen, fertilizer manufacturers, experiment station officers and others throughout the entire year, and especially at some seasons when the letters received number about one thousand per week.

(8) The judging of grains, roots, potatoes, etc., at agricultural exhibitions. Within the past year the writer, or one of his staff, acted as judge at the Canadian National Exhibition, Toronto; the Fall Fair, Guelph; the Spring Seed Fair, Guelph; the Autumn Seed Fair, Guelph; the Fall Fair, Stratford; the Fall Fair, Simcoe; the Spring Seed Fair, Markham; and the Provincial Winter Fair, Guelph.

(9) The furnishing of plants, seeds, and instructions for demonstration plots at the exhibition grounds at Simcoe, Ontario.

(10) The fulfilling of duties required of the Secretary of the Ontario Agricultural and Experimental Union, the Vice-President of the Canadian Seed Growers' Association, Dr. Robertson's representative on the Board of Control of the Macdonald Consolidated Rural School, a member of the seed committee of the Ontario Provincial Winter Fair.

(11) The outlining of courses of instruction in Field Husbandry for the agricultural classes in the High Schools and in the short summer course for Public School teachers.

Experimental Work in Field Husbandry.

About fifty acres of land, divided into upwards of 2,000 plots, are used for experiments conducted with varieties of grain, root, tuber, grass, clover, fodder, silage, and other crops; with artificial, green and farmyard manures; with methods of cultivation, selection of seed, dates of seeding, etc. All of these experiments are conducted with the greatest care, and for several years in succession in order to secure strictly accurate results. These experiments deal with the crops grown on over nine-tenths of the cultivated land in Ontario.

The grounds have a gentle slope towards the southwest, and the soil is an average clay loam. About one-quarter of the land is manured each year with twenty tons of farmyard manure per acre; thus most of the land receives an application of farmyard manure once every four years. No commercial fertilizers are used except in distinct fertilizer experiments, and these occupy only a small number of plots each year. Within the past eleven years one green crop has been plowed under on each section of the field. The plots vary in size according to the requirements of the different experiments, and the yields per acre are determined from the actual yields of the plots in every instance.

Although these two new hybrids, produced from Emmer and Spelt, are quite different, they are both from the same parents.

New wheats produced at the College by means of cross-fertilization.

Farmers examining the plots of grass mixtures.

The work in the Experimental department consists in planning the various experiments; laying out, seeding, and looking after the field plots; harvesting, threshing, weighing and testing the grain; taking up, weighing, counting, testing and storing the potatoes and roots; cutting, weighing and harvesting the grass, corn and fodder crops, etc., and also in picking by hand the samples of grain grown on the plots, some to be sown on the plots the following year and some to be distributed for co-operative experimental work throughout Ontario. A great deal of thought and care is required in planning, supervising and examining these plots, and in studying, comparing and summarizing the results for presentation in reports, bulletins, newspaper articles, and lectures.

Results of Experiments.

All of our field experiments are conducted for at least five years before conclusions are drawn, and many of them continue for a much longer period of time. For the results of some of the tests which were carried on for five or more years previous to 1907, the reader is referred to former reports. The results of some of the experiments which have as yet been conducted for only one or two years, are withheld until the tests can be carried through for at least another summer. As different seasons vary so much in temperature, rainfall, etc., the average results of experiments continued for several years are of much greater value than those secured from only one or two years' work. Owing to the great care exercised in the work and the number of years through which the experiments are continued, we are able to present the results with much confidence in their reliability and in their practical value. From year to year the reports of the experimental work are being more widely read and more carefully studied by the farmers of the Province, and this is leading to a greater interest in crop production and a deeper knowledge of plant life on the farms of our country.

Weather Conditions in 1907.

In order to better understand the results of the experiments with field crops conducted at the College, it is important to have a knowledge of the weather conditions of the different seasons during which the experiments were conducted. In each of the past eight years, careful records of the rainfall have been kept in connection with the Physical department at the College. The following table gives the total amount of precipitation in each of the six months of the growing season in each of the past eight years, as recorded at the College.

Month.	Amount of Precipitation during the six growing months.								
	1900	1901	1902	1903	1904	1905	1906	1907	Average of 8 years.
April	1.69	2.24	2.43	2.69	2.10	1.82	1.44	1.66	2.01
May	1.03	3 26	1.67	2.44	3.01	3.89	2.71	2.64	2.58
June	4.47	1 53	3.06	3.05	2.86	3.24	4.06	1.11	2.92
July	3.05	4.07	6.43	2.67	4.99	4.60	4.65	1.92	4.05
August	.87	3.51	2.18	3.47	3.88	1.98	2.13	.62	2.33
September	1.52	2.45	3.58	1.48	2.80	2.85	2.49	2.87	2.51
Total	12.63	17.06	19.35	15.80	19.64	18.38	17.48	10.82	16.40

Experiments with potatoes in the front and with mixtures of grasses in the rear

Weighing grasses grown on the experimental plots.

Hauling in Barley which was grown in the plots in connection with the work in plant breeding.

The foregoing table presents some interesting figures in reference to the rainfall during the summer season of each of the past eight years. It will be observed that in 1907 the rainfall was exceptionally light, the total amount being only about two-thirds as much as the average total for the past eight summers. It will be observed also that the amount of rainfall in June, July, and August was exceptionally small, being less than one-half the usual amount in each of these months. According to the records for Ontario, as taken by the meteorological department in Toronto, we learn that the average amount of precipitation for the six months of the growing season for each of the twenty-four years previous to 1907 was 15.92 inches. It will, therefore, be seen that the total rainfall at the College for the six months of the growing season of the present year is only about two-thirds as great as the average rainfall for a similar period for each of the past twenty-four years, throughout Ontario.

Farm Crops in Ontario.

According to the latest census of Canada, the annual value of the products of Agriculture is seven times greater than that of the forests, eight times greater than that of the mines, and nineteen times greater than that of the fisheries. In fact the products of agriculture are greater in value than the combined total value of all these and also of the manufactured products less the cost of material.

According to the same statistical report, we learn that the agricultural wealth of Ontario is greater than that of all of the rest of the Dominion combined. There are yet vast areas of good farming lands in Northern Ontario, of which only a small proportion is just being brought into cultivation, the greater amount being still unoccupied and in fact almost unknown.

The people of Canada are proud of the great wealth of natural resources in the form of the mines, forests, and fisheries of the Dominion. Not many, however, realize that the annual value of the field crops grown in Ontario alone is greater than the combined value of the products of the forests, and the mines, and the fisheries of the whole of Canada. It is exceedingly gratifying to note that the average yield per acre of some of the principal farm crops is now increasing from year to year, owing to the introduction of better varieties and to the improved methods of agriculture which are being adopted. There are yet exceptionally fine opportunities and almost unlimited possibilities for the agriculture of Ontario. The young men of the Province have plenty of room for their best thoughts and their deepest study in their endeavours to become thoroughly good farmers, in the highest sense of the term. The fertility and the cultivation of the soil, the ripening and the storing of the crops, the selection and the preservation of the seed, the feeding and the care of the farm stock, the breeding of the plants and the animals, and many other problems of great value and of intense interest, require not only a practical training in the operations of the farm, but also a good knowledge of the underlying principles of agriculture and exceedingly good judgment in the application of those principles to the various operations on the farm. In agriculture, nature is a co-worker with man. It is therefore essential that man know something of the laws of nature before he can expect to develop an agriculture of the highest type. Even the most common plants and animals, and the most humble operations on the farm are worthy of the best thoughts of the best men. In order to know which are the most valuable classes of crops to grow to meet

the various requirements, the most desirable varieties of each class to furnish the largest amount of food of the best quality, the most suitable time and method to sow each variety to use advantageously the fertility and the moisture in the soil, etc., are all questions which every farmer should determine for himself. In this work, however, the Experimental department at the College is in a position to give a large amount of valuable assistance. As the market value of the farm crops of Ontario now amounts to about $135,000,000 annually, we believe that it shows both good judgment and economy on the part of the Government to develop largely the experimental work in Field Husbandry at the Colloge.

We can easily perceive that slight mistakes in the selection of the most suitable crops for growing in the various localities, while they may not prove disastrous, may easily result in considerable loss to the individual farmer. Sufficient thought has not been given to this phase of the question of crop production amongst our farmers. The selection of crops is necessarily governed to a large extent by the location of the farm, the quality of the soil, the particular kind of farming which is followed, etc. There are many things to be taken into consideration in the selection of those crops which are likely to give the best satisfaction. Every farmer knows that oats will, as a rule, yield more bushels per acre than will barley, and that barley in turn, is likely to yield more bushels per acre than wheat; but the bushel is a bulk measure and not a weight measure, and the weight of grain produced per acre is of much greater importance than the bulk. As there are more than four million acres of the cultivated land in Ontario devoted to the growing of oats, barley, spring wheat, spring rye, and peas, it is both interesting and valuable to make a study of the comparative yield of these crops, taking weight instead of bulk into consideration.

The following table which has been compiled from the reports of the Bureau of Industries, gives the average yields for twenty-five years in both bushels and pounds per acre of barley, oats, field peas, spring wheat and rye, grown on the farms throughout Ontario.

	Bushels.	Pounds.
Barley	27.6	1,325
Oats	36.2	1,231
Field Peas	19.4	1,164
Spring Wheat	15.9	954
Rye	16.4	918

From this statement it will be seen that barley surpasses oats in yield of grain per acre by nearly one hundred pounds per annum in the average of Ontario for a period of twenty-five years.

An experiment has been in progress at the College for the past six years in order to glean as much reliable data as possible regarding the relative productiveness of our principal spring grains. For this experiment seeding took place on April 24th, 1902; on May 5th, 1903; on May 4th, 1904; on April 24th, 1905 and in 1906; and on May 3rd, 1907. In each of these years, twelve varieties of farm crops were grown in duplicate, making in

all twenty-four plots in the experiment each season. The following table gives the average results of the twelve tests made during the six years in date of ripening, length of plants, percentage of rust and yield of both straw and grain per acre, and also of the duplicate test made in 1907 in yield of straw and of grain.

Varieties.	Date of Ripening	Length of Plants.	Percent'ge of Rust.	Straw per acre.		Grain per acre.	
	Average 6 years, 1902-'07.	Average 6 years, 1902-'07.	Average 6 years, 1902-'07.	1907.	Average 6 years, 1902-'07.	1907.	Average 6 years, 1902-'07.
		inches.		tons.	tons.	lbs.	lbs.
Emmer (Common)....	Aug. 17...	39	4	2.0	2.2	2,968	2,756
Barley (Mandscheuri).	" 4...	40	5	1.7	1.9	2,595	2,715
Oats (Joanette)	" 14...	38	7	2.2	2.7	2,449	2,559
Hulless Barley (Black).	" 4...	31	8	1.9	2.0	2,433	2,527
Early Oats (Alaska)...	" 7...	41	10	1.7	2.1	2,149	2,395
Hulless Barley (White)	" 7...	33	6	1.6	1.9	1,813	1,992
Spring Wheat (Wild Goose)	" 24...	47	9	2.4	2.4	2,339	1,905
Spring Rye (Common)	" 14...	53	4	1.9	2.1	1,805	1,780
Field Peas (Early Brittain).....	" 21...	44	.....	1.3	1.7	2,212	1,772
Flax (Common)	" 15...	28	.....	1.6	2.0	1,326	1,100
Grass Peas (Common).	Sept. 8...	50	.....	2.0	2.2	444	753
Vetches (Common) ...	" 2...	34	.....	.7	1.6	5	595

The results at the College, as well as those throughout Ontario, show that barley has given a greater yield of grain per acre than oats. In the figures presented in the table, it will be seen that the Mandscheuri barley surpassed the Joanette oats by an average of over one hundred and fifty pounds of grain per acre per annum. The difference between the Mandscheuri barley and the Alaska oat, which is a very early variety, is even greater. The Common Emmer, however, stands the highest in average yield of grain per acre of the twelve different kinds of grain under experiment. Emmer represents one of the types of spring wheat, the grain being used as feed for stock instead of for the production of flour. Common Emmer has about 21, Joanette oats about 23, and Mandscheuri barley about 15 per cent. of hull on the grain. In 1907, the spring wheat and the field peas gave exceptionally high, and the grass peas and vetches unusually low yields per acre.

The Choice of Varieties.

Not only is it important to select the most suitable classes of crops in order to meet the requirements of the farm and of the farm stock, but it is necessary to give close attention to the particular varieties of each of the different classes of crops. After carefully watching the crop production of the Province and closely observing the experimental work at the College for the last twenty-two years, the writer is thoroughly convinced of the importance of farmers securing the best varieties of crops possible for their own particular farms and requirements. Some varieties are particularly desirable, owing to the fact that they usually produce very heavy yields per acre; while others are desirable, owing to the fact that they are exceptionally early in maturing. Some varieties of grain produce very long straw and are particularly suitable for growing on land which is rather poor in quality, while other varieties naturally produce short straw and generally thrive well on rich, mel-

low loams. It is difficult to express in a few words the great importance of a proper selection of varieties for crop production, as there are so many things to be taken into consideration. In order to show somewhat clearly some of the differences in varieties in regard to yield per acre, we here present the average results from growing four varieties of barley, four varieties of oats and four varieties of potatoes, for eighteen years; and of four varieties of winter wheat for eleven years.

Classes.	Varieties.	Number of years.	Average yield per acre.
			bushels.
Barley	Mandscheuri	18	70.9
	Oderbrucker	18	64.3
	Mensury	18	60.0
	New Zealand Chevalier	18	59.4
Oats	Joanette	18	88.6
	Siberian	18	87.5
	Egyptian	18	76.4
	Black Tartarian	18	71.3
Winter Wheat	Dawson's Golden Chaff	11	54.6
	Imperial Amber	11	51.3
	Treadwell	11	45.3
	Turkey Red	11	45.3
Potatoes	Empire State	18	223.7
	Rural New Yorker, No. 2	18	202.9
	White Elephant	18	200.5
	Stray Beauty	18	163.9

Although the table here presented shows marked differences in the productiveness of different varieties of barley, oats, winter wheat and potatoes, when those varieties have been carefully tested over a long series of years, there are many decidedly more striking differences than these amongst the long list of varieties which have been grown for a shorter period of time. The figures here presented, however, show quite clearly that some varieties are apt to produce much more heavily than others when grown under similar conditions from year to year. It is important to know that although the different varieties of barley, oats and potatoes have been grown in the Experimental department at the College for eighteen years in succession, the average yield per acre for the last five years is considerably greater than the average yield per acre for the first five years of the eighteen year period in the case of each of the varieties under experiment. As there was no change of seed from one farm to another during this length of time, it shows that it is quite possible to grow these crops for a considerable length of time without the introduction of fresh seed from other localities, providing proper care is exercised each year in the quality of the seed used.

The Ontario Agricultural and Experimental Union.

The Ontario Agricultural and Experimental Union is doing an admirable work in this Province. It forms a close connection between the scientific worker at the College and the practical worker on the farm. Under the guidance of this organization, upwards of four thousand farmers throughout Ontario conducted co-operative experimental work in agriculture at their own homes in 1907. When the farmers themselves once become both inter-

ested and active in the carrying out of some important and well defined line of experimental work, they have entered upon a course of thought and action, the good results of which it is impossible to correctly estimate. This work not only enriches the lives and improves the farming operations of those who are actually engaged in the work, but it also tends to the betterment of agriculture generally. It helps to impart to those who engage in the work some of the important and essential features of a true education.

Improvement of Farm Crops.

Our work in plant breeding has been receiving a considerable amount of attention during the past few years. This involves the systematic testing of varieties, the thorough selection of plants and seeds, and the proper mating and skilful crossing of varieties of different characteristics, in order to pro-

Making a cross-fertilization of different varieties of wheat

duce new sorts with the object of combining the good qualities and of eliminating the undesirable characteristics of the parent varieties. Work of this kind requires not only a practical knowledge of the greatest needs of the farmers, but also a scientific knowledge of the laws of nature and especially of heredity, as well as a considerable amount of time, money, good judgment, patience and perseverance. About 17,000 hybrid plants of farm crops were grown separately in the experimental grounds at the College this season. Some exceedingly interesting and very promising hybrids have already been obtained. It has been stated that the introduction of improved varieties of farm crops, through the medium of the Agricultural College and the Experimental Union, is worth to the Province of Ontario as much as it would require to maintain one hundred agricultural colleges. The prospects for future work in plant breeding and in plant introduction are very encouraging.

Different Dates of Seeding.

Experiments have been conducted at the College in each of five years by sowing spring wheat, barley, oats and peas on each of six different dates in the spring; also by sowing Emmer and Spelt on each of eight different dates in the spring, and by sowing winter wheat on each of six different dates in the autumn of the year in order to obtain reliable and specific information regarding the best time to sow the different classes of farm crops.

Oats, Barley, Spring Wheat and Peas. In each of the five years in which this experiment was conducted with oats, barley, spring wheat and peas, the first seeding took place when the land was warm enough and dry enough to work to good advantage. One week was allowed between each two seedings unless unfavorable weather compelled a change of a day or two in the date of seeding. The grain was sown on each of six dates in each year, the average of the first date being April 18th and of the last date May 23rd. In yield of both grain and straw per acre, the highest results were obtained from the first date of seeding with the spring wheat and the barley, and from the second date of seeding with the oats and the peas. It was observed that as the date of seeding was delayed, the percentage of rust in the resulting crop was gradually increased, with only one slight exception. The results indicate the importance of sowing spring wheat, barley, oats and peas in the order here given, starting with the spring wheat and finishing with the peas. An exceedingly important lesson may be learned from the results of this experiment which show that for every day's delay in the seeding after the first week had passed in which the seeding took place, there was an average decrease of 56 pounds of oats, 53 pounds of barley, 29 pounds of spring wheat and 23 pounds of peas per acre.

Emmer and Spelt. In each of the past five years, both Emmer and Spelt have been sown on eight different dates in the spring of the year, by making the first sowing in each season as early as the land was suitable for cultivation. One week was allowed between each two dates of sowing. The average results of the experiments for five years are presented in the following table:

Dates of Seeding.	Average results for 5 years.					
	Lbs. per measured bushel.		Tons of straw per acre.		Lbs. of grain per acre.	
	Spelt.	Emmer.	Spelt.	Emmer.	Spelt.	Emmer.
First	28.3	40.1	1.6	1.9	2,377	2,747
Second	27.3	39.1	1.6	2.0	2,163	2,848
Third	26.3	39.1	1.7	2.0	1,898	2,646
Fourth	24.9	37.6	1.6	2.1	1,582	2,754
Fifth	24.2	36.7	1.5	2.1	1,287	2,569
Sixth	21.6	36.1	1.6	2.3	933	2,465
Seventh	19.6	35.4	1.5	2.4	685	2,312
Eighth	19.9	34.0	1.5	1.9	499	1,953

In an examination of the results as presented in the table, the reader will be impressed with the superiority of the Emmer as compared with the Spelt in weight of grain per measured bushel, and in yield of both straw and grain per acre. In no instance does the Spelt show a superior record to the Emmer. This superiority of Emmer over Spelt is also clearly shown in the

results of the variety tests and need not be given further attention here. It will also be noticed that the second seeding and also the fourth seeding of the Emmer produced a higher yield of grain per acre than was obtained from the first seeding. In the case of Spelt, however, there was a very marked decrease in the yield of grain per acre as the date of seeding advanced. The results of all the experiments in sowing spring grains at different dates point to the conclusion that Emmer can be sown at a later date in the spring than any of the other cereals.

Winter Wheat. From experiments in sowing winter wheat on six different dates in the autumn of the year, the highest yields per acre have been obtained from sowing between the 26th of August and the 9th of September.

Quantity of Seed per Acre.

Many tests conducted at the College indicate the importance of sowing about ninety pounds of winter wheat per acre on an average soil. This amount might be increased for poor land and decreased for rich soil. If the land is in a good state of cultivation, it matters but little whether the seed is sown broadcast or with a tube drill, but if the land is dry or lumpy, that which is sown with the drill is likely to give the best results.

For three years in succession, each of four varieties of flax has been sown at the rate of one peck, two pecks, and three pecks, two bushels, three bushels, and four bushels per acre, making in all twenty-four plots in the experiment each year. On averaging the results of the four varieties sown with each of the quantities of seed per acre here indicated, we find that the yields of straw per acre and that the yields of flax seed per acre, after the seed used was subtracted from the crop produced, were as follows: One peck; 1.4 tons, 15.2 bushels: two pecks; 1.8 tons, 18.1 bushels: three pecks; 2.1 tons, 18.8 bushels: two bushels; 2.5 tons, 19.1 bushels: three bushels; 2.5 tons, 16.4 bushels: and four bushels; 2.5 tons, 13.5 bushels. It will be seen therefore that the greatest yield of flax seed, less the amount of seed used, was obtained by sowing two bushels of seed per acre. It is generally understood that when seed production is the only object in view, a much thinner seeding is desirable than when the crop is intended for the production of fibre. Therefore, when this experiment was commenced, it was expected that one of the first three seedings mentioned above would probably indicate the best quality of seed to sow per acre for the production of seed, and that one of the largest seedings would give a similar indication regarding the sowing of flax for fibre production. When flax is s wn quite thickly, the stems grow slender and upright and do not branch, with the result that a much longer and better quality of fibre is produced than when thinner sowing is resorted to. There was a marked difference in the production from the different varieties, as will be seen under the discussion of the varieties of flax in a later part of this report.

Preparation of Land for Winter Wheat.

In an experiment conducted for several years in succession, winter wheat grown on land on which a crop of field peas was used as a green manure, produced an annual average of about 6½ bushels more wheat per acre than that grown on land where a crop of buckwheat had been plowed under.

In the Experimental department, winter wheat which has been grown on clover sod has yielded much better than that which has been grown on timothy sod.

The Best Time to Cut Winter Wheat.

For seven years in succession, five plots of each of the Dawson's Golden Chaff and the Early Genesee Giant varieties of winter wheat have been sown at the same time in the autumn and cut at five different dates in the following summer, a week being allowed between each two dates of cutting. Seed from each of the seventy cuttings was sown and the crop therefrom was harvested when ripe. As a result of all the experiments conducted, we find that seed which was allowed to become thoroughly ripened before it was cut, produced a greater yield of both grain and straw, and a heavier weight of grain per measured bushel than that produced from wheat which was cut at any one of four earlier stages of maturity.

Treatment of Grain for Smut.

In some seasons, great losses are sustained throughout the Province of Ontario through the development of smut in the crops of wheat and oats. As a large amount of this loss can be easily prevented by treating the seed before it is sown, we direct the reader's attention very particularly to the results of experiments conducted along this line. Each of two varieties of oats have received seven different treatments in each of five years, and each of two varieties of winter wheat have received five different treatments in each of four years. The various treatments used were as follows:

(1) *Immersion in Diluted Formalin.* The solution of formalin used for the immersion process was made by pouring one-half pint of the formalin into 21 gallons of water, and the seed oats were immersed in the solution for twenty minutes.

(2) *Sprinkling with Diluted Formalin.* One-half pint of formalin was poured into 5 gallons of water. The oats were then sprinkled with this solution and carefully stirred until the grain was thoroughly moistened.

(3) *Immersion in Hot Water.* For this treatment, the grain was placed in a bag, which was then immersed in water at about 115 degrees F. Soon afterwards it was placed in water which was kept at a temperature of between 130 degrees and 135 degrees F. The grain was occasionally stirred, and was allowed to remain in the water for a period of fifteen minutes. It was then spread out on a clean floor to dry, where it was stirred occasionally.

(4) *Immersion in Bluestone Solution for Twelve Hours.* In this treatment, the bluestone solution was made by dissolving one pound of bluestone in 25 gallons of water, and the oats were immersed in this solution for a period of twelve hours.

(5) *Immersion in Bluestone Solution for Five Minutes.* For this treatment, a strong solution was made by dissolving one pound of Copper Sulphate (bluestone) in one gallon of water, and then immersing the oats in the solution for a period of five minutes.

(6) *Immersion in Potassium Sulphide Solution.* The Potassium Sulphide treatment consisted in soaking the seed for two hours in a solution made by dissolving eight pounds of Potassium Sulphide in 50 gallons of water.

(7) *Sprinkling with Bluestone Solution.* This solution was made by dissolving one pound of bluestone in 10 gallons of water, which was used for sprinkling over the oats until they were thoroughly moistened after being carefully stirred.

(8) *Untreated.* One sample of oats of each variety was left untreated in order that the influence of the various treatments might be observed.

After the treatments had been completed a few hours, the grains were carefully sown on separate plots, each of which was exactly one rod square. When the winter wheat was about ready to cut, it was carefully examined and the smutted heads were picked out and shelled. The rest of the crop was then threshed and again examined for the smut balls. When the oats were coming into head, they were examined frequently and all smutted heads removed and carefully counted. The following table gives the average results in percentage of smutted grains of winter wheat, and of smutted heads of oats for the number of years during which the experiments were conducted.

Treatment.	Oats.	Winter wheat.
	Per cent. of smut in crop. Average of 5 years.	Per cent. of stinking smut in crop. Average of 4 years.
Immersion in diluted formalin	.0	.0
Sprinkling with diluted formalin	.0	.0
Immersion in hot water	.0	.0
Immersion in bluestone solution for 12 hours	.1	.0
Immersion in bluestone solution for five minutes	.8	.....
Immersion in Potassium Sulphide solution	1.2	.....
Sprinkling with bluestone solution	1.3	.1
Untreated	5.7	3.5

The untreated winter wheat in 1907 had a little less than one per cent. of smutted grain. This amount was exceptionally light. In 1905, over nine per cent. and in 1904, nearly four per cent. of the whole crop from the untreated seed was ruined with smut. Whether the amount of stinking smut is large or small, it can be very effectually prevented by the formalin treatment mentioned above. The foregoing table shows that several treatments have been quite successful in preventing the development of stinking smut in wheat and of the loose smut in oats, but some of them have proven to be slightly injurious to the seed to which they are applied. The results of all the experiments, however, show that the greatest yield of winter wheat and the greatest yield of oats per acre was produced from immersing seed in a solution, made by adding one pint of formalin to 42 gallons of water, in which the grain was immersed for a period of twenty minutes. This treatment was easily applied, comparatively cheap, effectual in killing the smut spores, and also effectual in producing the largest average yield of both wheat and oats per acre of all the treatments used.

Susceptibility of Different Varieties to Attacks of Smut.

At one time it was considered that variety exerted but slight influence in regard to the amount of injury caused by smut. It is certainly true that smut in grain cannot possibly occur unless there are smut spores present which are capable of re-production. It seems quite evident, however, that varieties of both winter wheat and oats do not offer equal conditions for the growth and the development of smut. Some varieties certainly appear to be decidedly

more susceptible than others to the attacks of smut. During the years 1902, 1903, 1904, and 1905, we did not treat our varieties of oats for smut, but carefully picked out all smutted heads each year and kept an accurate record of the amount of smut produced in the different varieties. The results are very striking. The following gives the number of smutted heads taken from a plot 10 links wide by 100 links long, from different varieties of oats in each of the years 1902, 1903, 1904, 1905.

Variety.	1902	1903	1904	1905
Early Ripe	.....	.....	3	.....
Joanette	20	9	10	18
Siberian	32	43	78	20
American Banner	116	303	317	22
Black Tartarian	332	608	369	62
Early Champion	634	380	1,244	166

The foregoing table shows a wonderful difference in the comparative amount of smut produced by the different varieties of oats. Another year we expect to add smut spores to a few varieties which are usually very free from smut, in order to ascertain whether in the midst of an immense quantity of smut spores the varieties will still prove as resistant as they have in the past. Each of these varieties was treated with formalin in the spring of 1906, and not a trace of smut was found in any of the plots in that season. In the spring of 1907, the seed was not treated before it was sown and the number of smut heads which appeared on each plot was as follows: Early Ripe, 0; Joanette, 2; Siberian, 1; American Banner, 3; Black Tartarian, 3, and Early Champion, 11. These facts seem to show that the smut is again increasing most rapidly in those varieties which previously showed a marked susceptibility to the attacks of smut.

It will be observed from the foregoing table that the amount of smut produced is regulated to a large extent by the season, as there was decidedly more smut in the oat crops of 1903 and in 1904 than in those of 1902 and 1905.

It is quite probable that the Early Ripe is entirely immune to the attacks of smut. It is true that there were three smut heads found in the plot in 1904, but when it is considered that about 17,000 grains of oats are sown in each plot, it is quite likely that the three smutted heads were all from one plant, produced from a seed of some other variety which, by means of manure or in some other way got into the plot. Taking advantage of the apparent immunity of the Early Ripe oats to the attacks of smut, we have now about one hundred and eighty crosses between this variety and the American Banner. The Early Ripe variety is the earliest oat amongst some two hundred and fifty varieties which we have grown in the experimental grounds, but the grain is long and slender, giving a very light weight per measured bushel. If we can secure a hybrid, possessing the good qualities of the American Banner with the earliness and the immunity to smut of the Early Ripe, it will prove of exceedingly great value to the agriculture of the Province.

Seed Mixtures for Grain Production.

A large amount of experimental work has been carried on at the College within the past eighteen years in the endeavor to glean reliable information

regarding the different values of grain mixtures, in comparision with the growing of the same grains separately for the production of both grain and straw. Most of these experiments have now been conducted for several years in succession, and the results which have already been obtained have exerted a considerable amount of influence throughout Ontario, in a general sowing of certain grains in definite proportions.

For five years in succession, an experiment was conducted in growing oats, barley, spring wheat, and peas separately, and in eleven different combinations, having two, three or four grains in each mixture. The results show that the grain which was sown in mixtures produced larger yields per acre than the same kinds of grain sown separately, in from ninety to ninety-five per cent. of the tests. Of the eleven distinct mixtures used, the combination of oats and barley gave the highest average yield of threshed grain per acre. This mixture also gave a decidedly larger yield than any of the grains grown separately.

Barley and Oats Used in Combination.

In the spring of 1899 it was decided to conduct an experiment by sowing nine different proportions of oats and barley in order to determine which mixture and which quantity of seed would give the best results in the production of grain and straw. The lightest seeding used consisted of one-half bushel of oats and one-half bushel of barley, and the heaviest seeding of one and one-half bushels of oats and one and one-half bushels of barley per acre. The experiment was conducted for six years in succession. The average results showed that the greatest number of pounds of grain per acre was produced from a mixture of one bushel of oats (34 lbs.) and one bushel of barley (48 lbs.), or a total amount of 82 pounds of mixed seed per acre. For a fuller report of this experiment, the reader is referred to pages 31 and 32 of the Ontario Agricultural College Bulletin No. 140. In the spring of 1907, another experiment was started by testing nine different proportions of oats and barley. A mixture of four pecks of oats and four pecks of barley by weight per acre was the only mixture which was similar in the two experiments. The experiment was conducted twice in 1907: first, by using the Mandscheuri barley and the Daubeney oats; and second, by using the Chevalier barley and the Siberian oats. The average results of the duplicate experiment are as follows:

Mixtures. Quantities of seed per acre by weight.	Average yield per acre, 2 sets.	
	Tons of straw.	Lbs. of grain.
3 pecks Oats, 3 pecks Barley	1.23	1,678
3 " " 4 " "	1:31	1,764
3 " " 5 " "	1.33	1,911
4 " " 3 " "	1.25	1,790
4 " " 4 " "	1.33	1,979
4 " " 5 " "	1.22	1,851
5 " " 3 " "	1.26	1,742
5 " " 4 " "	1.09	1,664
5 " " 5 " "	1.05	1,650

One of the interesting features of the results of this experiment is the fact that the highest yield per acre was produced from four pecks (34 lbs.) of oats and four pecks (48 lbs.) of barley, the identical combination which gave the highest yield of grain in the former experiment of a somewhat similar character which was conducted in duplicate in each of six years. Another interesting feature of the experiment is the fact that both the lightest and the heaviest seedings gave comparatively low results in yield of grain per acre. This experiment will likely be repeated for several years.

In 1902 and in each of the four years following, an experiment was conducted in duplicate in order to ascertain whether a seed mixture, composed of one bushel of oats and one and one-half bushels of barley per acre, could be improved by the addition of a small quantity of some other kind of seed. In addition to the mixture of oats and barley here mentioned, one-half bushel of flax, emmer, spring wheat and hulless barley were added, making in all five different combinations. The average results of the ten tests made in the five years showed that the greatest yield of grain per acre was produced by the use of oats and barley without the addition of any other kind of grain as included in this experiment.

When barley and oats are grown in combination, it is, of course, necessary to use varieties which will mature at about the same time, in order that they may be harvested to best advantage. For this purpose, a very early variety of oats should be used with the common six-rowed varieties of barley, or a very late variety of barley should be used with an ordinary maturing variety of oats. For an early ripening crop we have found that Mandscheuri barley and Daubeney oats make an excellent combination, but where it is desirable to use such oats as the Siberian or the Banner, the later two-rowed barleys, such as, the Chevalier or the Canadian two-rowed should be used in the mixture. Our experience and the experience of other experimenters in different parts of the Province, goes to show that the mixture of Mandscheuri barley and Daubeney oats gives splendid satisfaction, ripening well together and producing a large yield of grain. In 1907, an extensive experiment was conducted at the College in order to ascertain whether any mixture could be found which would likely give better satisfaction than the Mandscheuri barley and the Daubeney oats, which had given such good returns in the past. As a result of all the combinations used, it was found that the highest yields of grain were produced by the Mandscheuri barley combined with either the Daubeney or the Alaska variety of oats. These two mixtures were followed most closely by a combination of the French Chevalier barley with the Siberian oats, the Mandscheuri barley with the Joanette oats, and the Mandscheuri barley with the Guy Mayle barley. A mixture made by using either the Banner or the Siberian oats with the Mandscheuri barley proved unsatisfactory, owing to the difference in the maturity of the varieties and to a lighter yield of grain obtained per acre.

Twelve Kinds of Grain Grown in Combination.

In the spring of 1902, an experiment was started in growing twelve kinds of grain in different combinations. One of the principal objects of this experiment was to learn which of twelve different kinds of grain would produce the greatest percentage of both straw and grain in the crop produced. The mixtures were made up in two different ways: first, by using the same amount

of seed of each variety as is usually sown when the grains are grown separately; and second, by using equal quantities of seed of all the varieties. Each of the mixtures here described was sown at the rate of 112 pounds of seed per acre. Both parts of the experiment were conducted in duplicate each year. The following table gives the average results of two tests in each of six years, and shows the percentage of each grain in the crop produced from each of the methods of combination indicated above :

Varieties used in each mixture.	Percentage of grains in mixtures.			
	Uniform weights of seed sown. 6 years. 12 tests.	Quantities of seed in same proportion as when grown separately. 6 years. 12 tests.	Average of two classes of mixtures.	
			1907 4 tests.	6 years. 24 tests.
Six-rowed Barley (Mandscheuri).....	18.1	17.1	18.5	17.6
Spring Rye (Common).....	13.3	14.1	15.7	13.7
Hulless Barley (Black).....	12.5	14.2	9.9	13.3
Early White Oats (Alaska).....	12.7	9.4	10.6	11.0
Black Oats (Joanette).....	11.9	8.6	11.3	10.2
Emmer (Common).....	7.0	7.9	11.2	7.5
Hulless Barley (White).....	5.8	6.9	5.3	6.3
Peas (Field).....	4.4	7.6	4.8	6.0
Spring Wheat (Wild Goose).....	4.8	6.3	8.8	5.6
Grass Peas.....	5.6	4.7	2.9	5.2
Vetches (Common).....	2.3	1.9	.0	2.1
Flax (Common.....	1.8	1.3	1.2	1.5

The comparative value of the different classes of crops for growing in mixtures is quite clearly shown in the tabulated results of six years' experiments here presented. It will be seen at once that there is a somewhat higher percentage of six-rowed barley in the product of both mixtures than of any of the other grains. The common spring rye made a strong fight for supremacy in the battle of the survival of the fittest in the experiment of 1907. Although the spring rye has made a very good showing in regard to production, it is not nearly as suitable a crop to sow with barley as a variety of oats which will mature at the right time. In the table here presented, the oats also stand comparatively high in the percentage of grain in the crop produced. These results therefore go to confirm the results of other experiments, and show that it is difficult to make a mixture which will produce a heavier yield of grain per acre than one made by a combination of barley and oats. It will also be seen from this table that emmer produced but a small percentage of the mixture in either test, showing that while it is a heavier yielding grain when sown alone, it is not so well suited for growing in combination with other crops.

In the spring of 1907, another mixture somewhat similar to the one just described, but which contained only eight varieties, was used for seed purposes. This mixture was also sown on four separate plots and the crop produced was carefully analysed. The following gives the percentage amount of grain from each crop included in the mixture: Mandscheuri six-rowed barley, 24.1; Red Fife spring wheat, 16.9; Common Emmer, 13.8;

Banner oats, 13.6; Wild Goose spring wheat, 10.6; Dakota Mammoth spring rye, 10.2; Early Britain field peas, 5.9; and Guy Mayle hulless barley, 5.1. The results of this experiment again show the supremacy of the Mandscheuri six-rowed barley when used in combination with other grains. Experiments with this mixture will likely be repeated for several years in succession.

Varieties of the Same Crop Grown in Combination.

For four years in succession we have grown different varieties of winter wheat in combination, with the object of ascertaining whether or not there was any advantage in growing mixtures as against growing the varieties separately. The results so far show that the mixtures have given very similar results to the averages of the varieties when grown separately. In an experiment conductd in 1907, in growing the different varieties of oats separately and in combination, it was found that there was practically no advantage from mixing the varieties for crop production. The results of our experimental work up to date, therefore, seem to strongly indicate that there may be a decided advantage from growing different classes of cereals in combination, but that there is no marked advantage from growing different varieties of the same class in combination.

Varieties of Oats.

With the exception of the area devoted to the production of hay and pasture in Ontario, no other crop is grown so extensively as oats. The number of acres used for the oat crop in 1900 was 2,398,834. The area has gradually been increasing since that time, until at present upwards of 2,700,000 acres are used for the cultivation of the oat crop in this Province. This area is fully three times as great as that used for any other cereal which is grown in Ontario.

No less than two hundred and ninety-five varieties of oats have been tested in the Experimental department at the College within the past nineteen years. Most of these have been tested very carefully for at least five years in succession. Many of them have proven comparatively worthless for growing in Ontario, but a large number are good varieties and some are decidedly superior in yield and in quality to many of the kinds which were formerly grown extensively throughout the Province. The oat crop throughout Ontario during the past year was considerably below the average in yield of grain per acre. In many parts of the Province, the leaves of the oats turned yellow and the plants became unthrifty for a time, apparently owing to the very peculiar weather conditions of the past season. As the oat crop is such an important one, and as there have been so many inquiries regarding this crop during the summer of 1907, it is thought wise to present the results of this crop somewhat in detail. We had under experiment this year ninety-two named varieties of oats, besides a considerable number of selected strains and a large number of hybrids which were originated at the College. As fifty-nine varieties of oats have been grown under competition in the experimental plots at Guelph in each of the past five years, and as we believe the results will be studied with a great amount of interest, we present the averages of these varieties in this report. The

average results for five years and the yield per acre for 1907 of each of fifty-nine varieties of oats are as follows :

Varieties.	Days to mature. Average 5 years.	Height. Average 5 years. Inches.	Per cent. rust. Average 5 years.	Weight per measured bushel. Average 5 years.	Yield per acre.		
					Tons of straw. Average 5 years.	Bushels of grain.	
						1907.	Average 5 years.
Yellow Russian	111	47	11	33.0	2.8	69.5	102.0
Vick's American Banner	112	49	14	34.8	2.9	65.9	101.9
New Zealand	112	48	12	33.7	2.6	68.4	99.4
Peerless	112	50	14	34.2	2.7	64.7	97.7
Irish Victor	112	51	16	34.8	2.4	66.4	97.4
Siberian	109	48	11	34.2	2.5	71.7	96.8
Michigan Wonder	112	50	15	34.6	2.5	67.1	96.7
German Rust Proof	112	50	13	34.3	2.7	68.0	96.4
New Golden Cluster	112	47	13	31.2	2.5	66.2	96.3
Ertragreichster	113	49	14	33.6	2.6	66.0	96.1
Liberty	112	50	14	33.5	2.7	63.9	96.0
Ligowa Hafer	109	48	13	35.9	2.7	64.9	95.9
Imported No. 534, Iowa	107	46	10	33.7	2.3	64.6	95.8
Imported No. 545, Iowa	108	46	8	34.2	2.3	61.2	95.5
Canadian Pride	108	48	10	33.4	2.4	69.7	95.2
Waterloo	112	49	13	34.9	2.5	67.1	94.4
Newmarket	109	49	12	35.8	2.6	72.6	94.3
The Great American	112	50	15	32.5	2.8	64.2	93.1
Joanette	110	42	6	35.1	3.1	68.6	92.9
Prince Royal	109	48	16	35.0	2.4	63.2	92.3
Rennie's White Irish	109	48	12	35.9	2.6	59.7	92.1
Twentieth Century	109	47	13	35.0	2.3	64.0	92.0
Swedish Wisconsin No. 4	108	49	13	35.1	2.4	66.1	92.0
Abundance	109	49	13	35.6	2.6	65.2	91.6
Improved Ligowa	109	48	12	35.9	2.5	63.8	91.4
New Sensation	110	46	11	35.9	2.6	62.3	91.2
Oderbrucker	111	47	13	35.0	2.4	62.1	91.1
Bavarian	111	50	11	34.5	2.9	60.0	91.0
Alaska	100	45	5	34.4	2.1	78.7	90.3
Waverly	113	50	15	35.2	2.7	63.3	90.1
Daubeney	101	43	6	34.4	2.1	80.8	90.1
Sheffield Standard	111	48	14	35.0	2.5	64.3	88.5
Napoleon	111	48	14	34.6	2.5	64.3	88.2
Original Leutewitzer Gelbhafer	112	49	13	34.1	2.6	56.1	88.0
Golden Fleece	112	49	14	33.9	2.6	63.9	87.4
Black Anthony	112	47	13	32.3	3.1	67.8	86.3
Probsteier	111	47	12	35.9	2.3	59.0	86.3
Potato	111	47	15	36.0	2.6	64.8	85.2
Egyptian	110	49	12	37.5	2.9	72.4	85.0
Tobolsh	108	48	13	37.2	2.5	61.9	84.9
Reliable	114	48	13	30.0	3.1	65.9	84.5
Black Beauty	105	43	13	34.9	2.6	59.4	83.9
Black Tartarian	113	48	13	32.2	2.6	59.9	83.9
Molian	109	50	13	34.3	2.7	56.9	83.0
Goldfinder	116	47	18	31.4	2.8	58.0	82.8
Early White Pearl	105	46	11	33.4	2.5	67.4	82.5
Black Diamond	107	44	10	30.3	2.6	56.6	81.5
Tartar King	108	48	14	35.1	2.5	56.6	81.5
Sunshine	117	48	17	30.1	3.0	60.8	81.5
Early Champion	102	45	8	34.6	2.1	63.5	81.3
Prosperity	100	43	7	34.4	2.4	58.0	80.7
Besler's Hafer	114	54	16	34.6	3.1	53.2	80.5
Early Ripe	98	42	6	28.5	2.2	65.0	79.5
Black Mesdag	99	48	10	31.2	2.5	78.4	79.4
Pioneer	107	42	16	35.0	2.7	55.7	79.0
Zhelannie	104	50	13	37.2	2.8	50.7	76.6
Early Dawson	104	50	13	39.3	2.9	44.4	70.6
White Superior Scotch	104	50	13	38.5	2.6	44.4	69.4
Hulless Oats	107	50	8	....	3.1	45.5	56.2

It will be observed that the varieties are given in the order of verage yield of grain per acre for five years. Each of two varieties produced an annual yield at the rate of a little more than 100 bushels of grain per acre. Twenty-nine varieties gave an average yield of between 90 and 100 bushels, 21 varieties between 80 and 90 bushels, five varieties between 70 and 80 bushels, one variety between 60 and 70 bushels, and one between 50 and 60 bushels per acre. The ten highest yielding varieties produced an average of 22.8 bushels per acre per annum more than the ten lowest yielding varieties in the average of the five years' experiments. The ten highest yielding varieties also matured about eight days earlier on the average than the ten varieties standing at the bottom of the list in yield of grain. There was a difference of nineteen days between the earliest and the latest maturing varieties, the Early Ripe maturing in 98 and the Sunshine in 117 days after the seed was sown. Some of the oats which gave the heaviest average weight per measured bushel produced comparatively small yields of grain per acre. There was an average difference of exactly one foot in the comparative height of the different varieties, the Joanette being the shortest with 42 inches, and the Besler's Hafer the longest with 54 inches in height of crop. In average yield of straw per acre, the Alaska variety produced only 2.1 tons, while the Joanette and several other varieties produced 3.1 tons per acre, being a difference of exactly one ton per acre. The Joanette, although a very short strawed variety, stools wonderfully well and thus produces a comparatively heavy yield of straw per acre. There was a variation in the yield of grain per acre in 1907 from 44.4 for the Early Dawson and the White Superior Scotch, to 80.8 for the Daubeney. It is interesting to note that the Daubeney, which has previously proven itself to be one of the very best early varieties of oats, gave a greater yield per acre than all competitors, enumerated in the foregoing table under the very unfavorable weather conditions of the past year. The Daubeney produces a white grain, which is of very good quality indeed being quite thin in the hull. It is expected that the Yellow Russian, which occupies the highest place in yield per acre in the average of the experiments for five years, and the Daubeney, which gave a comparatively high yield of grain per acre in 1907, will be two of the varieties used for distribution throughout Ontario in 1908, to be used in connection with the co-operative experimental work of the Experimental Union.

The Strength of the Straw of Oats.

For several years there have been numerous inquiries regarding oats which would not become lodged, even on rich land and in wet seasons. Although we have not found any varieties of oats, amongst nearly three hundred, which would stand up under all conditions of environment, we have, however, found that there is a marked difference in the strength of the straw of different varieties. After studying a large number of varieties for several years, we selected ten different sorts in the spring of the present year and sowed them all in duplicate in low, rich ground in the experimental field. Amongst the ten kinds selected were some of the weakest and some of the strongest strawed varieties, as well as some of the highest yielding oats of former years. While the oats on the high land stood up comparatively well in 1907, those placed on the low land gave an excellent opportunity for studying the comparative strength of straw of the differ-

ent varieties. The following table gives the average results of the two sets of oats included in a special experiment to determine the comparative strength of straw of the different varieties in 1907.

Varieties.	Percentage of rust.	Percentage Lodged.	
		3 weeks before ripening.	When ripe.
Golden Beauty	21	5	60
Siberian	23	5	20
Sheffield Standard	26	5	59
Liberty	35	0	7
Iowa Silver Mine	20	7	31
Banner	30	1	8
Tartar King	21	0	64
Daubeney	21	1	8
Kherson	19	1	11
Early Champion	30	2	19

As the varieties are presented in the report in exactly the same order in which they were grown in the field, the results are very interesting, as they show very decided differences in the strength of straw of the varieties included in the experiment. Those varieties possessing the stiffest straw in 1907 were the Liberty, Daubeney, Banner, Kherson, Early Champion, and Siberian. In comparison with these we notice also that the Tartar King, the Golden Beauty, and the Sheffield Standard varieties became very badly lodged. It may be a surprise to many to know that the Tartar King became lodged more than any other variety in this experiment. This oat is considered to be very stiff in the straw. We have found in the past, that frequently the Tartar King will stand longer than many other varieties before lodging, but under a severe test, the straw becomes very brittle and occasionally lodges worse than the great majority of other varieties. When the Tartar King oats lodge, the straw is apt to break at right angles and the crop lies very flat on the ground and is not so apt to fill so well as some other varieties, the straw of which leans badly but does not break in such a way as to shut off the flow of sap through the straw.

Varieties of Six-Rowed Barley.

Barley is one of the most important cereal crops now grown in Ontario. The area devoted to barley has nearly doubled during the past ten years. Although the two-rowed barleys are grown very extensively in England, Germany and other European countries, the six-rowed varieties are used almost entirely in Ontario. Within the last twenty years, a large number of sorts have been carefully tested in our experimental grounds. These have nearly all been grown for at least five years in succession, after which the inferior kinds have been discarded and the best sorts have been continued in the experiments from one year to another. Each year new varieties have been added to the list. Four different kinds of six-rowed barley have now been grown under experiment for eighteen years in succession, the results of which will be found in an earlier portion of this report. From the figures there given, it will be seen that the Mandscheuri variety is decidedly superior to the others in yield of grain per acre. This variety was imported by the Ontario Agricultural College in the spring of 1889, and after being carefuly tested at the College it was distributed to the farmers of Ontario through the medium of the Ontario Agricultural and Experimental Union. It is now grown more extensively than any other variety in Ontario. The introduction of this variety has been worth a very great deal to Ontario

from a financial standpoint. In the average results for the past five years, Mandscheuri has given an annual yield of 12.5 bushels per acre more than the Mensury variety. Not only is there a marked difference in these two varieties in productiveness, but there is also a decided difference in the growth of the two varieties which can be distinctly noticed soon after the barleys have headed out. The color of the beard is so different in the two barleys that it is not very difficult to distinguish one from the other. Although both kinds are of Russian origin, they should not be considered as the same variety any more than the Golden Vine and the New Canadian Beauty varieties of peas should be considered, in certain parts of the United States, as identical with the same varieties of Canada field peas. From a recent test made at the Central Experimental Farm at Ottawa, Dr. C. E. Saunders recognizes the fact that the Mandscheuri and the Mensury varieties of barley have differences which are quite observable in appearance. The Mandscheuri was decidedly superior in appearan to the Mensury on the Central Experimental Farm in 1907, and Dr. Saunders informed the writer that he intended to drop the Mensury entirely after the present year. The California Brewing barley, which has been grown at the College for a number of years, produces a high yield of grain per acre, but the grain is very coarse, the beards exceedingly stiff, and the straw is short and weak. The Oderbrucker variety of six-rowed barley, which the College imported from Germany, is one of the closest rivals which we have of the Mandscheuri. Although this variety has given an average during the past five years of about seven bushels per acre more than the Mensury, it has also given an average yield of about six bushels per acre less than the Mandscheuri. The Zulu King, which is a barley with a black hull and regarding which a great deal has been said during the last two or three years, gave a yield of 19.3 bushels per acre in 1907, and 14.3 bushels per acre in 1906 less than the Mandscheuri.

The highest yield of six-rowed barley, produced in 1907, was from what is known as No. 21, which is a special strain originated from a selection from the Mandscheuri barley which we made here at the College in 1903, in which year we grew upwards of 9,000 plants from seeds of the Mandscheuri barley which had been planted by hand and at equal distances apart.

We have been successful in producing a considerable number of hybrid barleys, using the Mandscheuri as one of the parents. These hybrids are exceedingly interesting and some of them are quite promising. We hope to get from some of the hybrids new varieties which will be of considerable value for general cultivation in Ontario.

Varieties of Two-Rowed Barley.

Sixteen varieties of two-rowed barley were grown in the experimental grounds in 1907. Of this number, eleven varieties have been grown for five years and six varieties for fourteen years in succession. The average results for fourteen years are as follows:

Variety.	Lbs. per measured bushel.	Tons of straw per acre.	Bushels of grain per acre.
Two-rowed Canadian	53.0	2.2	64.6
Jarman's Selected Beardless	54.0	1.9	63.8
New Zealand Chevalier	51.9	2.4	62.2
French Chevalier	52.3	2.4	60.9
Duckbill	52.9	2.2	60.9
Selected Canadian Thorpe	52.9	2.1	60.8

There are two very distinct classes of two-rowed barley. Those varieties belonging to the first class have strong straw and rather short, upright heads, while those belonging to the second class produce a somewhat weak straw and long, slender, nodding heads. Varieties of both of these classes produce plumper and more uniform grain than that produced by the six-rowed barleys. The Two-rowed Canadian and the Duckbill belong to the former, and the Chevalier to the latter class.

In the experiment with different varieties of two-rowed barley in 1907, the highest yields were produced as follows: Imported No. 5591, Hanna No. 5590, Jarman's Selected Beardless, and New Zealand Chevalier.

Varieties of Hulless Barley.

Nine varieties of hulless barley were grown in the Experimental department in 1907. The greatest yields were produced by the Purple, Hog and Guy Mayle varieties. Six varieties of hulless barley have been grown in the Experimental department for fourteen years in succession. The average results in weight of grain per measured bushel and average bushels per acre for the fourteen years are as follows: Guy Mayle; 61.3, 48.3: Purple; 63.5, 45.4: Black Hulless; 62.6, 44.9: Hungarian; 59.2, 42.0: Winnipeg No. 2; 55.7, 38.7: and Large Skinned; 59.2, 38.5. Of these varieties, the Black Hulless has be n grown the most extensively throughout Ontario.

Varieties of Winter Barley.

Winter barley, grown at the College for eleven years, has given an average yield of 56.5 bushels of grain and 1.3 tons of straw per acre, and has produced grain which weighs 47.3 lbs. per measured bushel. In 1907, three varieties of winter barley were under experiment, the greatest yield being produced by the Tennessee variety, which was grown this year for the first time, and which gave an average of 53.4 bushels per acre. Within the past fourteen years the winter barley has been completely killed out on three occasions.

Varieties of Wheat.

According to several authorities, there are seven distinct species of wheat, and to one or another of these species all cultivated varieties belong. The species may be enumerated as follows:

(1) Common, fine, or soft wheat (*Triticum vulgare*).
(2) Turgid, or toulard wheat (*T. turgidum*).
(3) Hard, or flinty wheat (*T. durum*).
(4) Polish wheat (*T. polonicum*).
(5) Spelt (*T. spelta*).
(6) Emmer, or starch wheat (*T. dicoccum*).
(7) One-grained wheat (*T. monococcum*).

Nearly all the winter wheats and the majority of the spring varieties belong to the first class and are used chiefly for the production of flour.

Winter Wheat for Flour Production. Wheat and other autumn crops were sown rather more extensively throughout Ontario in the fall of 1906 than in the year previous. The crops, generally, got a good start before the approach of winter, but owing to the alternate freezing and thawing in the spring they were somewhat injured in certain parts of the Province. We learned, however, from the reports of our co-operative experiments that

fairly large yields of wheat of good quality were obtained in many localities. At the College, autumn sown crops gave very satisfactory returns during the past year. Both the winter wheat and the winter rye produced good average yields of grain, which was considerable above the average in quality. The results from the winter barley and the Hairy Vetches, however, were somewhat lower than those in 1906.

Fully two hundred and fifty varieties of winter wheat have been grown at the Agricultural College within the past eighteen years. All varieties are carefully tested for a period of five years, after which the inferior kinds are dropped and the most promising sorts are continued in future tests.

In 1907, sixty-four varieties were under experiment. Of this number, fifteen varieties have been grown for less than five years, and forty-nine varieties for five years or over. As fifteen of the varieties have been grown for at least twelve years, the average results of these are very interesting and valuable. The following table gives the average weight per measured bushel for eleven years, and the average yield of grain per acre for each of two periods of six years, and also for the whole period of twelve years.

Variety.	Color of grain.	Lbs. per measured bushel. 11 years. *1894–1907	Bushels of grain per acre.		
			6 years, *1894–1900	6 years, 1902–1907	12 years, *1894–1907
Dawson's Golden Chaff	White	60.0	56.7	56.0	56.4
Imperial Amber	Red	60.7	52.1	53.4	52.8
Early Genesee Giant	White	59.9	51.9	52.1	52.0
Russian Amber	Red	60.9	50.7	52.1	51.4
Early Red Clawson	Red	59.0	50.9	51.0	51.0
Egyptian Amber	Red	61.3	49.8	52.0	50.9
Rudy	Red	60.9	47.1	48.6	47.9
Tasmania Red	Red	61.7	47.4	48.0	47.7
Tuscan Island	Red	61.0	46.7	47.0	46.9
Geneva	Red	62.3	45.3	48.5	46.9
Bulgarian	White	60.7	46.1	47.3	46.7
Treadwell	White	60.6	42.3	50.3	46.3
Turkey Red	Red	61.2	41.3	51.3	46.3
Kentucky Giant	Red	61.2	42.4	49.4	45.9
McPherson	Red	61.9	43.9	46.8	45.4

In 1907, the fifteen varieties here reported gave an average of 47.7 bushels of grain per acre, and of 62.3 pounds of grain per measured bushel.

The Dawson's Golden Chaff, which stands at the head of the list in yield of grain per acre in the average results for twelve years of each of fifteen varieties, also occupies the highest place in yield in each of the six year periods. It produces a very stiff straw of medium length, beardless heads, with brown chaff and white grain, somewhat soft, but about the standard in weight per measured bushel. As the heads are beardless and the chaff is of reddish shade, the standing crop has a beautiful appearance and is conveniently harvested. The Imperial Amber produces a large amount of straw, which is rather weak, a bearded head with a red chaff, and grain about average in weight and in hardness. The Early Genesee Giant is sometimes classed as an amber wheat, but in our reports we always place it as a white grained variety. It possesses a short, compact, bearded head, and

*Owing to the very unfavorable weather conditions for Winter Wheat, in 1899 and 1901, the results for those two years are not included in the foregoing summary, and owing to the rainy harvest of 1902 the weights per measured bushel for that year are also excluded.

straw which is medium in length and also in strength. The grain of the Early Red Clawson variety weighs very light per measured bushel, and is comparatively soft and of poor quality. The grain of the Tasmania Red, Geneva, Kentucky Giant, Tuscan Island, and Turkey Red varieties is very hard, but the straw of each of these varieties is somewhat weak and the yield in every case is less than that of either the Dawson's Golden Chaff or the Imperial Amber.

Forty-nine varieties of winter wheat grown in 1907 have been under experiment for at least five years. In the five years' test the highest average yields of grain per acre have been produced by the Dawson's Golden Chaff (52 bushels), and other varieties which resemble it very closely, and which are as follows:—Abundance, 56.9 bus.; American Banner, 56.8 bus.; Beardless Rural New Yorker No. 6, 56.2 bus.; American Wonder, 55 bus.; Superlative, 54.5 bus.; Forty-fold, 54.1 bus.; Prize Taker, 52.4 bus.; Extra Early Windsor, 51.8 bus.; Mogul, 51.4 bus.; and Clawson Longberry, 50.3 bus. High average yields have also been produced by varieties of other types, such as: Paramount, 52.7 bus.; Imperial Amber, 50.1 bus., and Early Genessee Giant, 49.5 bus.

The heaviest weights of grain per measured bushel in the five years' test have been produced by the Economy, 61.9 lbs.; Geneva, 61.7 lbs.; Tasmania Red, 61.7 lbs.; Banatka, 61.6 lbs.; Kentucky Giant, 61.6 lbs.; and Crimean Red, 61.4 lbs.

Of the sixty-four varieties of winter wheat grown in 1907, the greatest yields of grain per acre were produced by the American Wonder, 77.1 bus.; Abundance, 63.9 bus.; American Banner, 63.8 bus.; Beardless Rural New Yorker No. 6, 63.8 bus.; Superlative, 62.8 bus.; Forty-fold, 62.8 bus.; and Prize Taker, 62.7 bus.: and the heaviest weights per measured bushel by the Northwester, 64 lbs.; Auburn, 63.9 lbs.; Ironclad, 63.8 lbs.; Tasmania Red, 63.6 lbs.; Banatka, 63.3 lbs.; Crimean Red, 63.3 lbs.; Bearded Pootung, 63.3 lbs.; Kentucky Giant, 63.2 lbs.; Yaroslaf, 63.1 lbs.; and Imperial Amber, 63 lbs.

According to the recent tests made in the bakery branch of the Chemical department of the College, the following were among the best varieties in furnishing good flour for bread production: Tasmania Red, Rudy, Onigara, Crimean Red, Yaroslaf, Turkey Red, Early Genesse Giant, Banatka, Northwester, Geneva, Imperial Amber, Tuscan Island, Kentucky Giant and Michigan Amber. These are all red wheats with the exception of the Early Genesee Giant, which is also classed as a red wheat in some sections. Unfortunately, most of these wheats are comparatively weak in the straw and are rather light yielders. Those varieties belonging to the Dawson's Golden Chaff type, although stiff in the straw and heavy yielders, produce grain with a lower percentage of gluten than many of the red kinds.

Generally speaking, white wheats yield more grain per acre, possess stronger straw, weigh a little less per measured bushel, are slightly softer in the grain, produce a more popular pastry flour and furnish a somewhat weaker flour for bread production than the red varieties.

Spring Wheat for Flour Production. The number of acres used for the growing of spring wheat for flour production throughout Ontario is decreasing from year to year, the area devoted to this crop at the present time being only about one-half as great as that of eight or ten years ago. There were in all, thirty-eight varieties of spring wheat grown in the Experimental department in 1907. Of these, the greater number were varieties grown for flour production. Amongst the heaviest yielders were the following: Carleton,

42.8 bus.; Preston, 36.5 bus.; Hungarian, 36.2 bus.; Herison Bearded, 35.9 bus.; and Minnesota No. 163, 35 bus. per acre. The Herison Bearded has given a yield of 30.2 bushels in the average of nineteen years; the Red Fern, 31.2 and the Red Fife, 30.4 bushels in the average of eighteen years; the Wellman Fife, 30.6 bushels in the average of sixteen years; and the Preston, 29.5 bushels per acre in the average of twelve years. A variety of spring wheat, under the name of Hungarian, obtained through the kindness of one of the students from the Argentine Republic, has given an average yield of 34.1 bushels per acre in the average of five years. This variety from the Argentine Republic is one of promise. The grain of the Herison Bearded variety weighed 65.7 lbs. in 1907, which is one of the heaviest weights of spring wheat ever produced at Guelph, although this same variety produced wheat which weighed 64 lbs. per measured bushel in 1905 and 65 lbs. per measured bushel in 1903.

Spring Wheat for the Production of Macaroni. The varieties of wheat used for the manufacture of macaroni belong principally to the third species mentioned in the foregoing list. Of this class of wheats, nine varieties were grown in 1907 and six varieties have been grown for fifteen years in succession. The following gives the average yield per acre for fifteen years of each of the six varieties: Wild Goose, 39.2 bus.; Medeah, 34.9 bus.; Bart Tremenia, 34.3 bus.; Sorentina, 33.2 bus.; Algiers, 32.3 bus.; and Ontario. 23.6 bus. per acre. The Wild Goose variety, which stands at the head of the list in yield per acre, is now grown over Ontario quite extensively, there probably being more acres devoted to this variety than to all other varieties of spring wheat combined. The Wild Goose spring wheat has been distributed throughout Ontario for a considerable number of years through the medium of the Experimental Union, and it has given large yields and has proven to be a heavy yielder throughout the Province. In the results for 1907, the Roumania, forwarded to us through the kindness of Dr. C. E. Saunders of the Central Experimental Farm at Ottawa, gave very good results indeed, the yield being 36.8 bushels per acre. The Iumillo variety, which has been exceedingly resistant to blight in the semi-arid regions of the United States, gave a yield of 33 bushels per acre in 1907, and of 29 bushels per acre in 1906, both of which are below those of the Wild Goose variety.

Spring Wheat for Feeding Purposes. From the classification of wheat at the beginning of this section of the report it will be seen that Emmer and Spelt are two distinct types. Each of these types or species of grain contains a number of varieties. They are used for grinding into meal for feeding to farm stock, owing to the fact that the chaff adheres to the grain and is not removed in the process of threshing.

In 1907, six varieties of Emmer and four varieties of Spelt were grown in the Experimental department. The variety of emmer which gave the greatest yield of grain was the Common, 3,152 lbs. and of spelt the Alstroum, 2,582 lbs. per acre. The lowest yielding variety of emmer gave about the same yield per acre as the highest yielding variety of spelt in the experiment of the past year.

The decided superiority of Emmer as a grain producer is very clearly shown by the figures in the table. For the six years through which this test has been carried, Common Emmer has given an average of 784 lbs. of grain per acre per annum more than the highest yielding variety of spelt. Not only is the superior yielding power of the emmer here shown but the better quality of the grain is also evident since there is a much lower per-

centage of hull on the emmer than on the spelt. The study of the table will reveal some very interesting facts regarding the value of these two classes of grain and also the merits of the different varieties of each.

Classes of crop.	Varieties.	Percentage of			Pounds per bushel. average 5 years.	Yield per acre.	
		Rust.	Crop lodged.	Hull with grain.		Tons of straw. average 6 years.	Pounds of grain average. 6 years.
Emmer	Common	3	25	21	39.5	2.3	3246
	Iowa	2	23	21	40.5	2.1	3042
	Russian	2	25	22	40.7	2.1	3000
Spelt	Red	12	3	30	28.5	1.9	2462
	Alstroum	17	4	30	28.5	1.9	2457
	White	13	3	31	29.0	1.8	2199
	Dasyanthum	15	13	30	28.5	1.8	1938

Polish Wheat. This grain has been sold under various local names, such as; Corn Wheat, Colorado Giant Rye, etc., but it is known more generally the world over as Polish wheat (*Triticum polonicum*). It has been under test in our plots for some fourteeen years. In 1907 it produced a low yield of grain per acre, furnishing only 18.7 bus. per acre as compared with upwards of 30 bus. per acre for several of the other varieties of spring wheat. In no year, out of the fourteen, has it produced as high a yield as the Wild Goose variety.

Varieties of Rye.

Although not extensively grown in Ontario the cultivation of Rye is still a fairly prominent feature of the agriculture in certain sections of the province. The area devoted to the growing of rye is about equal to that used for the production of mangels. It is interesting to note, however, that while the number of acres used for the growing of mangels is increasing that for rye is decreasing as time advances.

Spring Rye. The results for the experiments conducted at the college in 1907 show that four varieties of spring rye gave the following yields of grain per acre: Saatroggen, 36.5 bus.; Common, 31.8 bus.; Dakota Mammoth, 31.2 bus.; Prolific Spring, 31.1 bus. per acre. As these varieties have been grown for the past five years it is interesting to note the average yield of each variety for the five year period, which is as follows: Dakota Mammoth, 33.2 bus.; Common, 31.2 bus.; Prolific Spring, 30.7 bus.; and Saatroggen, 26.9 bus. per acre. It seems strange at first sight to notice the fact that the variety that gave the lowest average results for five years is the same variety that gave the highest yield per acre for 1907. This seeming inconsistency is clearly understood when we realize that the Saatroggen variety was obtained in Germany by the writer in 1901 and gave exceedingly low results during the first two or three years that it was grown in Ontario. This variety, however, produced the greatest yield per acre in 1905 as well as in 1907 and occupied second place in yield of grain in 1906. In the average results for the past three years it has given the largest yield per acre of any variety grown at the College. The Saatroggen is therefore the most promising variety of spring rye which we now have in Ontario.

Winter Rye. Four varieties of winter rye have been grown in the Experimental department in each of the past four years and have given the following average yields of grain per acre: Mammoth White, 67 bushels;

Washington, 62 bushels; Thousand Fold, 59 bushels; and Common, 58 bushels. In 1907, the yield per acre was in the same order as for the average of the four years, and in each case was upwards of 60 bushels per acre. In 1907, each of the varieties produced grain which weighed upwards of 59 lbs. per measured bushel, which is exceptionally heavy, as the standard weight per bushel for rye is 56 lbs.

Varieties of Corn for Grain Production.

Although about one hundred and thirty varieties of corn were grown in the Experimental department in 1907 a number of these were too late in reaching maturity to enable us to make determinations regarding the yields of shelled grain. About forty varieties, however, reached a sufficient stage of maturity to enable us to dry the ears, shell the grain, and thus ascertain the yields of shelled corn. The highest yields of grain produced in 1907 were as follows:—Farmer's Surprise, 67.9 bus.; Early California Flint, 67 bus.; Red Blazed, 65.2 bus.; Wisconsin Little Dent, 64.3 bus.; Wessel, 56.3 bus.; Hammond's White Cap Yellow Dent, 54.5 bus. per acre.

Nine varieties of corn have been grown and ripened in the Experimental department for seven years in succession. We present the following table which gives the average of seven years' results.

Varieties.	Average number of rows per ear.	Color of grain.	Yield of grain per acre (bus.)	
			1907.	Average 7 years.
King Phillip	8	Reddish.	50.9	61.2
Genesee Valley	8	Yellow.	45.5	58.0
Longfellow	8	Yellow.	33.9	54.2
Farmer's Friend	8	Yellow.	42.0	52.4
Red Blazed	8	Variegated.	39.3	51.5
Canada Yellow	8	Yellow.	43.8	50.9
Compton's Early	12	Yellow.	38.4	49.8
Burlington Hybrid	8	White.	51.8	47.4
Salzer's North Dakota	8	White.	32.1	46.4

The corns included in the foregoing table are all flint varieties. It will be noticed that with the exception of Compton's Early all possess ears having only eight rows. Those varieties of corn having small cobs and a small number of rows on each ear ripen earlier and cure more thoroughly than those having larger cobs and a greater number of rows per ear. The King Phillip has given a large yield of grain per acre in 1907 and also in the average results for seven years. Of the varieties included in this report the Farmer's Friend had the smallest percentage of cob per ear.

White Cap Yellow Dent Corn for Grain Production.

The White Cap Yellow Dent variety of corn has been grown quite extensively by a number of farmers in the south-western part of Ontario and has been used partly for grain production and partly for the silo. As a number of the best farmers have been growing this variety for a considerable number of years and have carefully selected the best ears from year to year, and as the corn has become somewhat changed in its growth through its continuous selection and through its different environments, an experiment has been conducted with seed obtained from the different growers. The following table gives the average results of two tests conducted in 1906 and 1907 in average height and total yield per acre, and also of the duplicate test conducted in 1907 in grain production.

County.	Grower.	Height. Average 2 years.	Tons of total crop. Average 2 years.	Bushels of grain per acre, 1907.
		inches.		
Essex	C. F. Knight	115	15.4	44.2
Middlesex	E. M. Zavitz	118	15.2	44.2
Essex	J. Hammond	119	12.8	42.4
Essex	J. Thomas	118	13.3	38.0
Essex	W. Bryham	116	13.0	35.3
Essex	C. Weigle	114	15.8	28.6

It will be seen that the greatest yields were produced from seed obtained from Essex and from Middlesex Counties. It will be noticed that there is a variation of grain per acre from 28.6 to 44.2 bus. Seed was also sown from Mr. H. Smith of Elgin County and Mr. A. Dawson of Essex County, but the grain was not sufficiently ripened to give satisfactory results for grain production in 1907. Of the different lots here reported those from Hammond, Zavitz, and Bryham were the earliest and those from Weigle and Knight were the latest in reaching maturity. The seed obtained from Mr. Hammond has proven itself to be from one of the very earliest strains of White Cap Yellow Dent corn which we have grown at the College. This variety, however, is rather small in the ear and lighter in the total yield than any of the other strains which we have had under experiment.

Varieties of Buckwheat.

Six varieties of buckwheat were grown under similar conditions in 1907. The yield of grain per acre of each of the varieties was as follows:—Rye buckwheat, 31 bus.; Common Grey, 28.5 bus.; New Calcutta, 27.4 bus.; Silver Hull, 26.8 bus.; and Japanese, 24.6 bus. per acre. The Japanese gave unusually low results in the tests of the past year. Three of these varieties have now been grown under similar conditions in each of the past ten years, the average results for that period of time in yield of grain per acre being as follows: Silver Hull, 21 bus.; Japanese, 20.4 bus.; and Common Grey, 18.3 bus. The Silver Hull is a fairly constant yielder, but the Japanese variety is somewhat irregular in grain production, producing high yields in some seasons and comparatively low ones in other years.

Varieties of Flax.

In the spring of 1905, flax seed was obtained from Ontario, Manitoba, Holland, Russia and from the Argentine Republic. Six different quantities of seed per acre were used with each of the four first mentioned lots of flax, and this experiment was repeated in 1906 and again in 1907. In averaging the results of the six plots of each lot of flax for the three years, we obtained the following comparative yields of seed per acre: Manitoba Flax, 21.3 bus.; Common Flax, 20. 4, bus.; Russia Flax, 17.7 bus.; and flax from Holland, 15.1 bus. In 1907, the Manitoba gave the highest yield with 21 bushels, and the Holland the lowest yield with 14.9 bushels per acre.

From the small lots of seed, obtained through the kindness of students from the Argentine Republic, we were able to compare the results by growing the seeds on very small plots the first year and on larger plots in 1906 and 1907. Of the four different lots of seed obtained from the Argentine Republic, there was a great variation in the yield per acre, one lot giving as high an

average as 19.3 bus. and another lot as low an average as 9.9 bus. per acre. Of all the different lots of seed obtained, the Manitoba flax has given us the highest yield of both seed and straw per acre.

Millet for Grain.

There were in all seventeen varieties of millet under test in the department during the past season and most of these gave very fair yields of grain, seven of the varieties producing upwards of 40 bushels of seed per acre. The greatest yield per acre in 1907 was produced from a specially selected strain of Siberian Millet, which gave a yield of 51.5 bushels of seed per acre. Following that, we have the yields in 1907 of some of the highest producing varieties as follows: Steel Trust, 48.3; Hungarian and Holy Terror Gold Mine, each, 42.6; German or Golden, 41.7; Hog, 41; Siberian, 40.8; and Magic, 40.6 bushels. The Japanese Panicle, which frequently produces a large yield of seed, gave comparatively low results in 1907. Sixteen varieties have now been grown for five years in succession, and those giving the greatest average yields of seed per acre were as follows: Siberian, 54.7 bus.; Steel Trust, 51.9 bus.; Hungarian, 47 bus.; and Early Harvest, 41.4 bus. In weight per measured bushel the White French gave an average of 59.8; Hog Millet, 58.9; and the Red French, 58.1 pounds in the average of the five years. The Hungarian Grass produced seed which weighed 53.9 and the Siberian seed which weighed 53.5 pounds per measured bushel.

Varieties of Sorghum for Seed.

Of the various kinds of sorghum, including broom corn, sugar cane, kaffir corn, etc., which have been grown at the College for seed production for several years in succession, the best yields of seed have been obtained from the broom corns. In the average of five years' results we have obtained yields per acre as follows: California Golden, 31.1 bus.; Early Japanese, 30.9 bus.; Dwarf, 30.1 bus.; and improved Evergreen, 30 bus. per acre. In 1907, owing to the comparatively cool and late spring, many of the sorghums did not ripen, but the Dwarf broom corn gave slightly over 31 bushels of seed per acre.

Varieties of Sunflowers for Seed.

No less than seven varieties of sunflowers have been tested in the Experimental department, and of this number three have been grown for nine years in succession. Taking the standard weight for sunfllower seed as being twenty pounds per measured bushel, we have obtained a yield of seed per acre in the average of nine years of 72.6 bushels from the White Beauty, 71.3 bushels from the Mammoth Russian, and 68 bushels from the Black Giant. These are certainly large yields per acre, but probably not much larger than might be expected from growing sunflowers under fairly good Ontario conditions. The seed is frequently used as feed for poultry.

Varieties of Field Peas.

Owing to the ravages of the pea weevil in south-western Ontario for a period of several years, many farmers discontinued the cultivation of the crop for a time. As the weevil has largely disappeared, however, the cultivation of this crop is again increasing to a considerable extent. No experiments were conducted at the College with different varieties of peas

during the years 1904, 1905, and 1906. In the spring of the present year, however, twelve varieties were sown in our experimental grounds and the results were very satisfactory. The highest yielding varieties in bushels per acre were as follows: Multipliers, 51; Early Britain, 50.7; Canada Field, 48.5; Potter, 48.1; Black Eyed Marrowfat, 47.7; Golden Vine, 46.7; New Canadian Beauty, 45.2; Clamart, 43.5; White Eyed Marrowfat, 37.3; Canner, 33.9; White Scimitar, 33.3; Prussian Blue, 25.4. Eight of the varieties grown in 1907 were also grown in the experimental grounds in each of seven years previous. The average yields in bushels per acre for the eight years were as follows: Early Britain, 38.2; Potter, 35.2; New Canadian Beauty, 32.3; White Eyed Marrowfat, 32; Prussian Blue, 31; Black Eyed Marrowfat, 29.7; Golden Vine, 29.5; and Multipliers, 29.2. It will therefore be seen that the Multipliers, which gave a very high yield per acre in 1907, is not usually a particularly high yielder. The Early Britain, however, which occupied second place in yield per acre in the test for 1907, has also given decidedly the greatest yield per acre of all the varieties tested at the College for eight years. The Early Britain variety of peas was imported from England about twenty years ago. It is a brown pea and is slightly indented on the sides of the grain. The weight per measured bushel is therefore not as high as that of some other varieties, and the pea is not as salable on the market, but for farmers who wish to grow peas for feeding purposes the Early Britain will probably prove to be one of the very best which they can secure for the purpose. The yield of grain is high, the straw is a little more than medium length, and both the grain and the straw is of good quality.

Varieties of Field Beans.

Fourteen varieties of field beans were under experiment at the College in 1907. Owing to the peculiar weather conditions, however, the crops were late in maturing and the yields were unusually low, the highest being those of the Pearce's Improved Tree, the Marrowfat, the Burlingame Medium, the New Prize Winner, and the Red Kidney varieties. The results from the beans in 1906 were also very peculiar, some varieties producing exceedingly high results, the Pearce's Improved Tree giving 37.5 bushels, and the Marrowfat only slightly over 12 bushels per acre. As these eleven varieties were all grown in each of the nine years previous to 1906 ,the average results for those years are of great importance. The highest yields were produced by Pearce's Improved Tree, White Wonder, Medium or Navy, Burlingame Medium, Schofield Pea, Day's Improved Leafless and Buckbee's Electric Tree varieties. The New Prize Winner, which has not been grown for so many years, has given very good satisfaction throughout, except in 1906 when its yield per acre was rather low.

Varieties of Soy, Soja or Japanese Beans.

Although a large number of varieties of this class of beans have been tested for some years on our trial grounds, most of them have proven to be quite unsuited for growing in Ontario, as they require a long season in which to mature. A few varieties, however, ripen quite early and produce grain which is very high in feeding value, being even richer in this respect than our common field peas. Among the varieties which mature their seed at the College, the Early Yellow is worthy of special mention. This variety has been grown at the College in each of twelve years and yields per acre have varied from 6.9 bushels in 1893 to 30.4 bushels in 1906. The average for the

twelve years is 15.3 bushels of seed per acre. The Medium Green variety of soy beans is a strong vigorous grower and usually produces a good yield of seed when it has time to mature before the nipping frosts occur in the autumn. It is, however, rather later than the Early Yellow variety and is rather unsafe to sow for grain production in Ontario, except on warm soils in the southern part of the Province. Soy beans are usually sown in rows from twenty-five to thirty inches apart, and about one-half bushel of seed is used per acre.

Cow Peas.

Although ten varieties of cow peas were grown in the Experimental department in 1907, not one variety matured seed. It is only in exceptional years that seed can be obtained from this crop in Ontario. Although the cow peas thrive admirably in the Southern States, the season required for their maturity is too long to enable the crop to mature in Ontario, except on the light warm soils and in favorable seasons.

Grass Peas.

Although Grass peas were grown quite extensively in the vicinity of Hamilton and in some other portions of the Province previously, the results from this crop have not been very satisfactory during the past few years, owing possibly to the seasons being somewhat cooler and the rainfall a little heavier than the average. The yield of grain produced from Grass peas at the College was only about 16.4 bushels per acre in 1907. We have obtained an average of about thirty bushels of grain per acre from the Grass peas over a series of years. The yield for 1906 and that for 1905 was, however, even less than that of 1907.

Vetches for Seed Production.

Hairy vetches have been used considerably as a cover crop in fruit districts and also as a fodder crop in a few localities in Ontario. They have also given good results for pasture purposes when sown in the spring and pastured in the same season, in the experimental work of the College. The seed, however, is very expensive, being mostly imported from Germany. In each of the past six years the Hairy vetches have been sown in the autumn and allowed to ripen in the following year. The results have varied greatly, the yields running from 1.5 to 18.2 bushels, the average for six years being 5.7 bushels per acre. In each of four years we have made a comparison between the use of imported seed and of Canadian grown seed for sowing in the autumn of the year. In every single instance, we have obtained decidedly better results from the Canadian grown seed. In the average results of the tests for the past four years we find that the yield of seed from the crop produced from Canadian grown seed was more than double that produced from imported seed. In 1907, the yield from Canadian grown seed was about three times as great as that from the imported stock. We feel in hopes that by continuously growing and selecting the Hairy vetches in Ontario, we may be enabled to produce a strain which is hardy and prolific in Ontario. Although we nearly always obtain larger yields of seed from Hairy vetches sown in the autumn than from those sown in the spring, in the past year we obtained decidedly better results in seed production from the spring seeding of Hairy vetches.

Potatoes.

Although the acreage devoted to potato growing in Ontario has been decreasing somewhat during late years owing to a variety of causes, such as, the scarcity of labor, the trouble from the rot, etc., yet this is an exceedingly important crop in connection with Ontario's agriculture. We believe that the area devoted to potato growing will increase during the coming year, owing to the fact that the rot almost entirely disappeared in 1907, and also to the fact that for a short time past the prices of potatoes have been considerably higher than usual. I wish to draw the attention of the reader to a valuable report on "Potato Growing in Ontario," prepared by Mr. H. B. Smith, a graduate of the College, who spent a considerable amount of time during the past summer in studying the potato question in the southwestern part of the Province. This report, which can be found in the annual report of Farmers' Institutes of Ontario for 1906, starting on page 35, contains a large amount of valuable information on this important crop.

Varieties. One hundred and eleven varieties of potatoes were grown in the Experimental department in 1907. Although the yields were not particularly high, the crop was entirely free from rot. Sixty varieties of potatoes have been grown in the Experimental department for at least five years in succession. Some very interesting information was given in reference to these varieties in our report for 1905, when the tabulated results of seventy-one varieties were given. From a study of experiments with different varieties of potatoes, grown both at the College and throughout Ontario, we find the following to be amongst the best when yield, size, freedom from rot, and table quality are all taken into consideration: late varieties; Empire State, Dempsey's Seedling, Rural New Yorker No. 2, and American Wonder: medium varieties; Rose of the North, and Burpee's Extra Early: and early varieties: Early Fortune, Early Harvest, Extra Early Eureka, Early Andes, and Early Dawn.

Planting Potato Sets of Different Sizes and at Different Distances Apart. For five years in succession, an experiment has been conducted by cutting potatoes into pieces of one ounce, one and one-half ounces, and two ounces in weight, and planting each twelve, eighteen, and twenty-four inches apart in the rows. As the results are very interesting and suggestive, we are incorporating in this report the averages for the past five years in the form of a table, which is as follows:

Weight of pieces.	Distance between pieces in the rows.	Per cent. of crop marketable. Average 5 years.	Total yield per acre. Average 5 years. Bus.
1 oz.	12	87	**144.9**
	18	88	**132.5**
	24	89	**114.1**
1½ oz.	12	84	**166.9**
	18	87	**144.7**
	24	88	**117.8**
2 oz.	12	84	**179.3**
	18	83	**151.2**
	24	88	**134.1**

It will be seen that the greatest yield per acre was obtained from the largest pieces which were planted the closest together. As the pieces increased in size, there was a gradual increase in yield per acre, and as the distance between the pieces in the rows decreased, there was also an increase in the yield of the crops produced.

Continuous Selection of Seed. For the past twelve years, continuous selections of seed potatoes have been made and the results recorded. The selections were large, medium sized, small, and very small potatoes which were planted without being cut. Decidedly the largest yield per acre was produced from the large whole potatoes, and as the seed potatoes decreased in size, there was also a decrease in the yields per acre of the potatoes. Not only did the small potatoes produce the lowest yield per acre, but the percentage of marketable potatoes in the crops produced was also the smallest.

Number of Potato Sets per Hill. In 1907, and in each of the seven years previous, an experiment was conducted by planting one piece, two pieces, and four pieces in each hill. The hills were the same distance apart in both cases, and the amount of seed used per acre was uniform throughout. The average results for the eight years show the annual yields per acre to be as follows: one piece per hill, 187.7 bus.; two pieces per hill, 183.1 bus.; and four pieces per hill, 165.4 bus. Not only is the total yield per acre in favor of having only one piece in a hill, but we find that in marketable potatoes there was 81 per cent. where only one piece in a hill was used, 77 per cent. when two pieces were used, and only 72 per cent. when four pieces were used in each hill. The more pieces per hill, the greater tendency there is to have a large number of stems which are weak, small and slender, and which seem to produce a large number of small potatoes.

Methods of Cultivation. Potatoes have been grown in rows about twenty-seven inches apart with the potato sets planted twelve inches apart in the row, in comparison with planting the potatoes in squares thirty-three inches apart each way. The same amount of seed was used in both cases. In 1907, the average yield per acre from the first method was 188 bushels, and from the latter, 149 bushels. In the average of nine years, the results of experiments are very similar to these, the average yield per acre from the rows being 193.8 bushels, and from the squares 154 bushels.

Treatment for the Potato Beetle. For twelve years in succession, an experiment has been conducted in duplicate by using different methods for destroying the potato beetle. The experiment consisted in spraying the potatoes with Paris green and water, Paris green and plaster, and Potato Bug Finish. As a rule, three applications were made on each crop. For the sake of comparison, one plot was allowed to remain untreated. The following gives the average annual yield of potatoes per acre from each of the treatments for the twelve year period: Paris green and water, 160.9 bus.; Paris green and plaster, 150.3 bus.; Potato Bug Finish, 129.7 bus.; and the potatoes which were left untreated, 87.1 bus.

In each of the past five years, six lots of each of two varieties of potatoes were carefully selected and planted on separate plots. After the potatoes had made sufficient growth and the potato beetles (bugs) had made their appearance, five plots of each variety were treated in different ways to destroy the beetle and one plot of each variety was left untreated, as a basis of comparison. The five treatments made in each of the years were as follows: (1) Paris green and water, by using one pound of Paris green and 96 gallons of water per acre; (2) Paris green and plaster, by using one pound of Paris green and 38 pounds of plaster per acre and applying the mixture

to the potatoes in the dry condition; (3) Potato Bug Finish, which was applied dry at the rate of 20 pounds per acre; (4) Bug Death and water, by using on an average 32 pounds of Bug Death and 96 gallons of water per acre; and (5) Bug Death used in the same proportion as No. 4, but in the dry condition. Three applications of each of the five treatments were made with each of the two varieties of potatoes. In the autumn, the potatoes from each of the twelve plots were dug and weighed. The following are the average results of the experiment conducted for five years in succession, showing the yields in bushels per acre from each treatment.

Treatment.	Average yield per acre. 5 years. Bus.
Nothing	104.3
Potato Bug Finish	145.3
Paris Green and Plaster	183.3
Paris Green and water	199.6
Bug Death (Dry)	203.5
Bug Death and water	211.4

In eight out of the ten tests made during the five years, those potatoes which were sprayed with Paris green and water surpassed those which were dusted with Paris green and plaster in yield of crop per acre. It will also be observed that the Bug Death and water gave better results than where the Bug Death was used in the dry condition. The Bug Death in solution gave considerablv larger yields of potatoes per acre than the Paris green and water. From the potatoes which were left untreated and on which the potato beetles were allowed to work unmolested, there was less than half the yield of potatoes, as compared with the crop produced from the treatment with Bug Death and water. The usual prices of these insecticides when bought in quantity are about as follows: Paris green, 20c.; Bug Death, 7c.; and Potato Bug Finish, 1⅔c. per pound. The cost therefore for the material used in the experiments conducted in the last five years was about as follows: Paris green and water, 60c.; Paris green and plaster, 88½c.; Bug Death, $6.72; and Potato Bug Finish, $1.00 per acre.

Bordeaux Mixture for the Potato Blight. A large number of interesting experiments were conducted in 1907 in treating the potatoes to prevent the blight. For the first time, however, in the last five years there was no rot, even amongst the potatoes which were not treated. For the results of past experiments the reader is referred to the annual reports of former years.

Varieties of Mangels.

The Mangel crop is increasing in popularity from year to year in Ontario. It is probably owing to the increase in the dairy industry and to the introduction of better varieties of mangels that the acreage devoted to this crop has been largely increased in late years. Mangels usually produce a large yield of roots per acre. The roots generally keep well, are relished by the farm stock and do not taint the milk when fed to milch cows. Twenty-four different varieties of mangels were tested during the past season. Of this number, 20 varieties have been grown for five years in succession.

The following table gives the yields of roots per acre for 1907 and also the yields of both the tops and roots for the average of five years.

Varieties.	Tons of tops per acre.	Tons of roots per acre.	
	Average of 5 years 1903-07.	1907.	Average of 5 years 1903-07.
Yellow Leviathan	6.1	39.7	35.2
Evans' Improved Mammoth Sawlog	6.7	34.2	34.4
Sutton's Mammoth Long Red	6.2	35.0	34.2
Griewener Mangel	3.2	36.9	33.5
Long White	6.0	37.7	33.2
Ideal	2.8	36.3	32.9
Steele-Briggs' Giant Yellow Intermediate	5.1	30.6	32.6
Simmers' Improved Mammoth Long Red	6.3	34.6	32.5
Carter's Windsor Prizetaker Yellow Globe	2.5	36.8	32.3
Mammoth Golden Giant	4.9	30.7	32.1
Garton's Improved Yellow Globe	2.4	44.6	32.0
Rennie's Perfection Mammoth Long Red	5.9	33.0	32.0
Carter's Mammoth Prize Long Red	6.1	31.1	32.0
Steele's Long Red Selected	6.4	37.1	31.7
Yellow Leutewitzer	6.3	40.0	31.5
Norbitan Giant	6.2	34.7	29.8
Cornish Giant Yellow Globe	2.3	29.4	29.7
Mammoth Red Intermediate	3.6	35.5	29.2
Steele-Briggs' Giant Yellow Globe	2.5	31.0	28.9
Red Globe	4.3	36.5	28.2

The report shows a variation from 2.3 to 6.7 tons in average yield of tops per acre. The tops contain a large percentage of mineral matter and if removed from the land are quite exhaustive. If the valuable plant food constituents, which they contain, however, are retained evenly over the soil the fertility of the soil is not exhausted to nearly as great an extent as if the tops were removed from the land entirely or were left in heaps over the field. In average yield of roots per acre there is a variation from 28.2 to 35.2 tons per acre, or a difference of exactly 7 tons. The Yellow Leviathan is an intermediate variety which has made exceedingly satisfactory records both in the experiments at the College and in the Co-operative experiments throughout Ontario. It has given a higher average yield of roots per acre than any of the different strains of the Long Red Mangel which have been grown at the College. It will be seen by a study of the results given in the table that there is a marked variation in the productiveness of the different strains of the Intermediate Mangel, the Yellow Leviathan producing six tons per acre more than the Mammouth Red Intermediate. The Yellow Leviathian has produced the highest yield per acre of all the mangels used in the co-operative experiments over Ontario for the past four years. Not only is it the highest yielder but it also produces roots of compact form, is easily harvested and is of good keeping and good feeding quality.

Canadian Grown Mangel Seed. Practically all of the mangel seed which is used in Ontario is grown in Europe. Owing to the severe winters in Ontario, and the cost of labor, it is very difficult to produce root seed to compete with that imported from other countries where the climate is milder and the labor is much cheaper. From certain experiments and observations we have had the impression that Canadian grown root seed, especially when

care was taken in the selection of the mother roots, would likely give better results than the imported seed. In the autumn of 1905 some very nice roots were selected and stored during the winter and in the spring of 1906 were re-planted. From some of these, seed was obtained in the autumn and was sown in the spring of the present year in the experimental grounds. Good seed was obtained from seven plants. The yield obtained from the seed of the individual plants varied considerably, the lowest being 29 tons and the highest being 53.6 tons per acre. The seed from 4 of the plants gave decidedly higher yields per acre than any of the 26 varieties of mangels grown in 1907 from seed which was imported. The three highest yields from Canadian Seed were: 53.6, 50.9 and 49.2 tons per acre.

Sugar Beets.

Sugar Beets are grown in Ontario both as a food for live stock and for selling to the factories for the production of sugar. With the first object in view the varieties mostly grown have roots of good size which grow considerably out of the ground and contain about 10 per cent. of sugar. When the object is sugar production, however, those varieties are grown whose roots grow almost entirely under the ground and which contain on an average about 15 per cent. of sugar. The roots of the varieties of sugar beets for sugar production are also considerably smaller than those grown for feeding the farm stock.

Varieties. In 1907, 26 varieties of sugar beets were grown at the College. Of this number, 20 have been grown for five years in succession. These include varieties which are usually grown for feeding to farm stock as well as those which have been selected for many years for the production of a high percentage of sugar. All varieties were grown in rows 21 inches apart and the roots were thinned to a distance of seven inches apart in the rows. The following table gives the yield of roots produced in 1907 and also the average yield of both tops and roots per acre in the experiments for five years.

Variety.	Tons of tops per acre.	Tons of roots per acre.	
	Average of 5 years 1903-07.	1907.	Average of 5 years 1903-07.
Giant White Feeding	3.8	19.8	31.3
Tankard Cream	3.1	15.3	27.3
Royal Giant	3.1	16.6	26.3
Giant Rose Feeding	2.6	17.4	26.0
New Danish Improved	4.1	18.1	24.6
Rennie's Giant Sugar	3.1	19.3	24.0
Imperial Giant Half Sugar	2.4	21.7	23.9
Hybrid Sugar Beet Mangel	3.2	20.8	23.8
Red Top	4.1	13.4	22.9
Red Skinned	3.5	14.8	21.9
Green Top White	5.0	17.4	21.5
White Silesian	5.2	14.8	21.2
Lane's Improved	5.1	14.8	21.0
Champion	7.2	14.5	19.8
Kleinwanzlebener	8.5	14.5	19.7
Improved Imperial	5.8	16.1	18.2
Kleinwanzlebener (Mette)	5.8	13.4	18.0
Jaensch's Victrix	7.0	13.9	18.0
Rubensamen (Rimpau)	7.1	14.2	17.9
French Yellow	4.2	10.7	15.8

It will be observed from the table that the Giant White Feeding variety of Sugar Beet gave an average yield of roots of four tons per acre more than the next highest yielding variety. The Giant White Feeding not only gave higher results in the average yield per acre at the College for 1907, but it also gave 3 tons per acre more than the Tankard Cream in the Co-operative experiments throughout Ontario in the past year. According to the analyses made by the Chemical Department at the College, the Giant White Feeding contained an average of 7.8 per cent. of sugar for six years, and the Tankard Cream an average of 8.9 per cent. of sugar for five years. The Royal Giant, which stands third in the list in yield per acre, contained an average of 9.9 per cent. of sugar and the Giant Rose Feeding 12.4 per cent. of sugar in the average analyses for six years. In comparison with this we have an average of 16.5 per cent. of sugar from the Kleinwanzlebener and of 17 per cent. from the Improved Imperial variety. These last two are grown almost entirely for sugar production.

An experiment was conducted by Prof. G. E. Day, of the Farm Department, in each of two winters by feeding mangels and sugar beets to milch cows. These two kinds of roots were found to give equal amounts of milk when equal amounts of roots were fed. It is quite probable that if each of these two classes of roots had been fed to fattening stock, a difference would have been seen in favor of the sugar beets which contained about 10 per cent of sugar, as compared with mangels which contained about 4½ or 5 per cent. of sugar.

Soaking Sugar Beet Seed Before Sowing. For five years in succession an experiment has been conducted as to the advisability of soaking sugar beet seed before sowing in order to soften the husk and hasten the germination. The experiment has been conducted in duplicate in each of five years by sowing seed which has been soaked in water for twelve, twenty-four and thirty-six hours. In each individual test one plot was also sown with seed which had not been soaked. In averaging the results for the five years' experiments, we find that soaking the seed proved beneficial in all cases. The greatest yield was given from seed which had been soaked for twenty-four hours. The average yield in this case was 15.2 tons per acre in comparison with 13.3 tons per acre from the unsoaked seed. There proved to be an advantage form soaking the seed in each year of the experiment except in 1907, in which season there appeared to be a slight disadvantage from the soaking of the seed. A similar experiment was conducted in 1906 in which mangel seed had been soaked in the same way as that described for the sugar beet seed. The results from the mangel experiment were similar to those of the sugar beet experiment. In the mangel experiment the greatest advantage, however, was obtained when the seed had been soaked for a period of 12 hours. This produced an average of 2.6 tons per acre over the yield from the unsoaked seed.

Thinning Beets at Different Distances in Drills. For five years in succession an experiment has been conducted by thinning plants two, four, six, eight and ten inches apart in the rows. This experiment was conducted in duplicate each year, and the Kleinwanzlebener, which is grown for sugar making purposes, was used throughout. The average results for the five years in yield of roots per acre are as follows: 2 inches, 17.8 tons; 4 inches, 15.8 tons; 6 inches, 15.7 tons; 8 inches, 15.6 tons and 10 inches, 15.5 tons. The study of the detailed results reveals the fact that as the distance between the plants increased there is a greater average weight per root, varying from about ½ lb. to about 1¼ lbs., but that there is also a decrease in the yield per acre from 17.8 to 15.5 tons. Of course, it must be borne in

mind that, while close thinning results in larger yields of roots per acre, it involves a greater amount of work both in thinning and in harvesting the crop.

Growing Beets in Rows at Different Distances Apart. This experiment has also been conducted in each of the past five years by sowing seed in rows which were made at different distances apart. Seven rows were sown in each plot. The outside rows were discarded and only the five inner rows were taken into consideration when determining the yield of the plots. The experiment was made in duplicate each year and the Kleinwanzlebener variety was used in each experiment. The five years' results of each test in the average weight of roots and in the yield of tops and of roots per acre are as follows:

Distances.	Average weight per root. 1902-3-4-5-7.	Yield of tops per acre. 1902-3-4-5-7	Yield of roots per acre. 1902-3-4-5-7
	Lbs.	Tons.	Tons.
Rows 12 inches apart	.62	9.14	**20.52**
" 14 "	.65	7.57	**19.19**
" 16 "	.73	8.08	**19.30**
" 18 "	.80	8.15	**18.90**
" 20 "	.87	7.97	**18.65**
" 22 "	.94	8.28	**18.44**
" 24 "	.99	8.09	**18.10**
" 26 "	1.04	8.16	**17.68**
" 28 "	1.11	8.16	**16.96**

In Germany where the sugar beet is used very extensively for factory purposes the rows are made rather closely together, being only 18 to 20 inches apart. By having the rows fairly close together and the plants quite near to each other in the rows it is claimed that the largest percentage of sugar is obtained from the beets. Our results show that when sugar beets are grown in rows 18 inches apart there is an average yield of about 2 tons per acre more than when the rows are at a distance of 28 inches apart. The analyses of the roots made in the Chemical department at the College for five years in succession show that on the average the roots which were 18 inches apart contained 16.9 per cent. sugar and those which were 28 inches apart contained 16.8 per cent. of sugar. These results seem to indicate that in the quality of the roots the distance does not matter very materially providing the roots are cultivated carefully and are not thinned to more than seven inches apart in the row. The farmer who grows his roots in rows 18 inches apart would, however, obtain a greater money value than the man who grows his sugar beets in rows 28 inches apart, owing to the greater yield of roots per acre.

Thinning Beets at Different Stages of Growth. In thinning sugar beets at four different stages of growth in each of the five years, 1903, 1904, 1905, 1906 and 1907, it is found that the greatest average yield per acre was obtained from thinning the plants when about two inches in height. There was an average increase of 1.3 tons per acre where the roots were thinned at a height of two inches as compared with those which were thinned at a height of eight inches.

Varieties of Swede Turnips.

Although the acreage devoted to the growth of mangels has been gradually increasing, that used for the growing of Swede Turnips has been slightly decreasing during the past few years. A considerable number of varieties of Swede Turnips have been grown in the Experimental department from year to year. In 1907 only five of the leading kinds were used in the Experimental department through lack of room in the grounds. The following gives the yields of roots per acre of each variety in 1907 and also in the average for the past five years: Hall's Westbury; 20.7 tons, 21.7 tons: Sutton's Magnum Bonum; 21.5 tons, 19.6 tons: Kangaroo; 21.1 tons, 19 tons: Hartley's Bronze Top; 17.4 tons, 18.9 tons: Buckbee's Giant; 17.4 tons, 18.9 tons. Unfortunately, the Carter's Invicta was not grown at the College in 1907. This is a variety which has given good results at Guelph and which was selected by several turnip exporters, who examined our crop in 1905, as being one of the most suitable of all varieties grown for the export of turnips for table use. It was used for the co-operative experiments over Ontario in 1907, and gave the highest yield per acre of those used for the co-operative work.

Varieties of Fall Turnips.

The fall turnips are not grown extensively in Ontario as they are not of as good keeping quality as the Swede turnips. Upwards of fifty varieties of fall turnips have been grown in years past. In 1907, however, owing to the lack of room, only four prominent varieties were included in the test. The following gives the yield in tons per acre for 1907 and also the average yield per acre for six years of each of the four varieties: Red Top White Globe: 35.3, 29.1; White Egg: 28.8, 24.1; Early American Purple Top: 24.8, 22.6; and Cow Horn: 24.3, 21. In 1907, the Red Top White Globe and the White Egg varieties were distributed throughout Ontario in connection with the co-operative experiments. The average results for the co-operative experiments show that the Red Top White Globe gave decidedly the largest yield of roots per acre.

Varieties of Kohl Rabi.

Kohl Rabi, although grown to a certain extent in the old country as feed for sheep and other farm stock has not been grown to any great extent for farm purposes in Ontario. The kohl rabi resembles cabbage in its root and Swede turnip in its leaf. The valuable part, however, grows about three inches above the ground in the form of a bulb. It makes excellent food for domestic use and is prepared for culinary purposes in much the same way as the Swede turnip. Four varieties were grown in the Experimental Department in 1907 and three of these have been grown for six years. The following gives the yields of roots for each of the three varieties grown in 1907 and also for the longer period. Early White Vienna, 22.4, 21.3; Earliest Erfurt, 31.3, 21.1, and Goliath Purple, 22.2, 17.8 tons per acre. The Garton's Improved Long variety of kohl rabi has been grown for three years in succession, but the results are considerably below the Early White Vienna variety.

Varieties of Field Carrots.

Nineteen varieties of field carrots were grown in the Experimental department in 1907. Of this number, 17 varieties have been grown for five

years in succession. The following table gives the yields per acre of the roots for 1907 and also the average yields for both the tops and the roots for the average of five years:

Varieties.	Tons of tops. per acre.	Tons of roots per acre.	
	Average of 5 years. 1903-07.	1907.	Average of 5 years. 1903-07.
Steele's Improved Short White	7.6	44.3	**34.3**
Mammoth Intermediate Smooth White	7.8	36.4	**33.3**
Mastadon White Intermediate	6.9	39.5	**33.0**
Iverson's Champion White Intermediate	6.9	34.6	**32.3**
Carter's Hundred Ton	6.6	33.9	**31.6**
Sutton's Matchless White	8.3	36.4	**31.5**
Simmers' Short White Vosges	6.9	37.3	**30.9**
Large White Belgian	6.9	30.5	**28.3**
Large White Vosges	6.3	31.1	**27.7**
American Beauty	6.2	28.1	**27.4**
Long Yellow Stump Rooted	5.3	30.5	**27.3**
Rubicon Half Long Red	6.2	30.5	**27.3**
White Griewener	8.1	27.8	**26.6**
Carter's Gate Post Orange Long	7.4	27.3	**26.0**
Sutton's Yellow Intermediate	6.6	29.0	**25.5**
Carter's Orange Giant	7.1	28.4	**25.3**
Garton's Intermediate	4.8	22.1	**22.7**

The experiments conducted with many varieties of carrots go to show that the long, slender, deep rooted, irregular varieties which were formerly grown to a large extent are no longer desirable. During the past few years many varieties of medium length and of a good thickness have been introduced and have given excellent satisfaction. The largest yielding varieties in the table here presented belong to this latter class while the long White Belgian variety has long roots, is difficult to pull and is comparatively light in yield as compared with some of the other kinds.

Carrots from Canadian Grown Seed. As in the case of mangel seed, we also produced carrot seed at the College in 1906. The seed obtained from the different plants was sown in the spring of the present year and gave fairly good results, but not as high in comparison with the imported seed as was obtained from the Canadian grown mangel seed. The production and testing of Canadian grown root seed will likely be continued in the future.

Varieties of Parsnips.

Although parsnips have not been used to any great extent for feeding to farm stock there are occasionally questions asked as to the advisability of growing this class of roots for farm tock. In order to obtain some information on this kind of crop, an experiment has been conducted in each of the past five years in comparing three different varieties. The results are very similar and are as follows for the five year period: New Ideal Hollow Crown, 11.9; Buckbee's New Sugar, 11.7 and Sutton's Cattle, 11.3 tons of roots per acre per annum. It will therefore be seen that the production from the parsnip is not nearly as large as that from the mangel, the turnip or the carrot.

Storing of Roots.

In each of the past few years mangels, sugar beets, turnips and carrots have been pitted in the field, stored in the root cellar and packed in boxes in sand in order to get some information regarding the proper methods of keeping roots, but we are as yet unable to give a satisfactory report regarding the pitting of roots in the field. It seems difficult to pit a small quantity and have them under the same conditions as when large quantities of roots are used. In the other methods of storing, however, we find that we can obtain as good results when the roots are stored in a cool cellar as when they are packed in sand, but in the latter there is less mould and sprout than those stored loosely in the cellar.

Varieties of Corn for Fodder and the Silo.

In many parts of Ontario, those farmers who planted a good sized field of corn in 1907 and who cultivated it carefully throughout the season, mostly obtained a large amount of valuable feed, even in those districts where the rainfall was very light and where the pasture and the hay crops were almost a failure. Although the acreage devoted to corn in Ontario in 1907 was larger than for a year or two previous, it is quite probable that corn will be cultivated still more extensively in 1908. There are scarcely any parts of Ontario in which some one or other variety of corn will not thrive satisfactorily, unless it is in the Northern districts. Even beyond the limits where it was thought that corn could be grown, certain varieties have been cultivated and even ripened with a considerable amount of satisfaction. It is of the greatest importance, however, to grow those varieties which are particularly suited to the localities in which they are grown. It is important for each farmer to do a certain amount of experimental work for himself. Before doing so, however, he will find very great assistance from results of experiments which we have conducted at the College with a large number of varieties, where not only the total yield per acre but also the yield of ears, the stage of maturity, etc., are taken into consideration. The variety test conducted at this Station should serve as a general guide to the farmers in most parts of Ontario, indicating to them the kinds which are likely to be suitable for their respective localities. It is indeed difficult to mention individual varietes of corn which are pre-eminently suited to Ontario. The requirements of the different localities are so very different that it seems necessary to give the results of a large number of varieties which can be studied by individual farmers, if the greatest value from the experiments is to be obtained. We therefore present the average of five years' results in growing fifty-seven varieties of corn under uniform conditions. The varieties in the list are arranged according to the total yield of green corn per acre. For these experiments, the corn was usually planted within the last ten days of May and it was harvested about the middle of September. Immediately after the crop was cut, the ears were husked, weighed, counted and examined. The stage of maturity of the corn is indicated by the condition of the grain at the time it was harvested. The seven terms which were used to describe the ripeness of the corn at the time of husking were as follows: Water, early milk, milk, late milk, dough, firm dough and ripe. The average results of the five years' experiments are as follows:—

Varieties.	Description of varieties.		Average results of five years' experiments.					
	Class of corn and color of grain.	Average number of rows per ear, 5 years.	Condition of grain when harvested.	Number of days until in full tassel.	Height of plants.	Weight per ear.	Yield per acre.	
							Husked ears.	Total crop green.
					Inches.	Ounces.	Tons.	Tons.
Pennsylvania Early Dent	Yellow Dent	20	Early Milk	106	131	7.24	3.04	27.37
Pedrick Perfected Golden Beauty	Yellow Dent	12	Early Milk	105	127	6.24	2.57	26.87
New Century Wonder	Flour	12	Water	112	118	2.68	.82	26.77
Eureka	Yellow Dent	16-18	Early Milk	102	126	8.87	3.75	25.78
100-day Bristol	Yellow Dent	14	Milk	102	125	7.17	3.50	25.34
Kansas Sunflower	Yellow Dent	16	Early Milk	105	126	5.34	2.55	24.17
Landreth's Large White Flint	White Flint	12	Early Milk	104	127	5.73	2.67	23.68
King of Illinois	Yellow Dent	20	Early Milk	104	126	7.27	2.97	23.49
Cloud's Early Yellow	Yellow Dent	20	Milk	102	123	8.31	3.68	22.96
Darke County Mammoth	Yellow Dent	18	Milk	100	121	8.93	4.29	22.96
Lenocher's Homestead	Colored Dent	16	Milk	96	114	8.60	4.13	22.58
Mastadon Dent	Yellow Dent	18-20	Milk	101	122	8.21	3.60	22.42
Salzer's North Dakota	White Flint	8	Dough	90	100	6.58	4.26	22.38
Triumph Sugar	Sweet	12	Late Milk	94	92	7.06	4.30	22.24
Marblehead Mammoth	Sweet	12	Milk	95	95	7.64	4.11	22.08
Early Butler	Yellow Dent	14	Milk	95	115	7.45	3.98	21.56
Golden Triumph	Yellow Dent	16	Early Milk	100	117	7.02	3.01	21.37
Indiana Wonder	Sweet	12	Milk	94	101	5.08	3.47	21.22
Late Mammoth	Sweet	12-14	Milk	100	99	7.32	3.44	21.14
Rennie's Early Giant White Dent	White Dent	14	Milk	97	111	8.17	3.88	21.05
Burlington Hybrid	White Flint	8	Dough	92	96	5.31	3.99	21.01
Reid's Yellow Dent	Yellow Dent	16	Late Milk	96	116	8.66	3.97	20.96
Mammoth Cuban	Yellow Dent	18	Milk	96	113	7.80	3.84	20.94
Snow White Dent	White Dent	16	Milk	97	114	8.52	3.95	20.81
Tuscarora	Flour	8	Late Milk	89	92	7.39	4.50	20.65
Wisconsin Earliest White Dent	White Dent	14	Milk	99	110	7.53	3.46	20.57
Early Mammoth	Sweet	12	Late Milk	96	93	7.54	3.95	20.49
Profit	Yellow Dent	16-18	Milk	99	118	8.38	3.59	20.45
Compton's Early	Yellow Dent	12	Firm Dough	88	101	8.58	4.40	20.41
Stowell's Evergreen	Sweet	14-16	Milk	97	95	6.73	3.47	20.21
Lowe's Perfection	Sweet	12	Late Milk	91	89	7.49	4.61	20.18

Rennie's Improved Leaming	Yellow Dent	18	Milk	101	116	7.44	2.91	19.84
Longfellow	Yellow Flint	8	Firm Dough	88	96	6.43	3.76	19.78
Iowa Silver Mine	White Dent	14	Early Milk	100	115	7.50	3.47	19.74
King Phillip	Colored Flint	8	Firm Dough	87	97	6.44	4.05	19.67
Wisconsin Yellow Dent	Yellow Dent	16-18	Milk	97	111	7.72	3.76	19.63
Mammoth Southern Sweet	White Dent	14	Milk	100	116	7.14	3.04	19.57
King of the Earlies Dent	Yellow Dent	14-16	Late Milk	93	109	7.07	3.53	19.49
Improved Leaming	Yellow Dent	16-18	Milk	99	114	7.76	3.11	19.48
Potter's Excelsior	Sweet	12	Late Milk	94	87	5.78	3.86	19.13
Canada Yellow	Yellow Flint	8	Firm Dough	89	99	7.44	3.80	18.74
Hickox Sweet	Sweet	12	Milk	96	91	7.28	3.46	18.17
Clarke's Cuban Giant	White Dent	16	Early Milk	105	120	6.33	2.17	18.15
White Cap Yellow Dent	Yellow Dent	16	Late Milk	96	109	7.75	3.34	18.15
Pee and Kay	Sweet	12	Dough	86	80	6.51	4.29	17.99
Red Blazed	Colored Flint	8	Ripe	85	95	7.04	3.89	17.72
Wisconsin Beauty	Sweet	12	Late Milk	89	80	8.09	4.69	17.41
Genesee Valley	Yellow Flint	8	Firm Dough	86	94	7.09	3.25	17.11
Black Mexican	Sweet	8	Dough	92	84	4.51	3.76	16.45
University No. 13	Yellow Dent	16	Dough	88	102	8.16	4.00	16.35
Kendal's Early Giant	Sweet	12	Dough	85	73	7.20	4.36	14.97
Perry's Hybrid	Sweet	12	Dough	87	76	7.49	3.84	14.96
Farmer's Surprise	Yellow Flint	8	Firm Dough	86	89	6.62	2.90	14.92
Wisconsin Little Dent	Yellow Dent	14	Firm Dough	81	96	8.55	4.14	14.39
Early Minnesota	Sweet	8	Dough	84	71	5.08	3.50	14.30
Ford's Early	Sweet	8	Dough	81	71	5.80	3.84	13.80
Farmer's Friend	Yellow Flint	8	Ripe	82	72	5.79	2.86	13.12

In 1907 the corn did not mature at Guelph nearly as well as it did in 1906. It should be remembered that the corn was husked immediately after it was cut. If the grain had been cut and shocked in the field for a time before it was husked, which is usually the practice on the farm, the grain, undoubtedly, would have ripened fairly well, even in some of the varieties which are here reported as being in the firm dough and in the dough condition. This information should be taken into consideration when studying the stage of maturity of the different varieties as presented in the tabulated results. When examining the results of experiments conducted at Guelph with the corn crop it should be remembered that the experiments have been conducted in a locality which is eleven hundred feet above the sea level and eight hundred and fifty feet above Lake Ontario and in latitude north 43°-38', also that Guelph is about 38 miles inland from the lakes. Keeping these considerations in view a large amount of valuable information can be gleaned from the figures presented in the table.

From the report here presented it will be clearly seen that the various kinds of corn possess many variations in productiveness and in the method of growth. We notice variations from 13 to 27 tons of total crop per acre, from $\frac{4}{5}$ of a ton to 4 $\frac{3}{5}$ tons of ears per acre, from 2 $\frac{5}{8}$ to nearly 9 oz. in the average weight per ear, from 8 to 20 rows per ear, from 71 to 131 inches in height of varieties and from the water to the ripe condition of the grain at the time that the corn was cut. Between these extremes we have a great many intermediate stages. In selecting a variety of corn for the silo, one should be chosen which furnishes, not only a large total yield, but which is likely to reach a good stage of maturity in the locality where it is grown before the severe frosts appear in the autumn. From a study of the table the superiority of one variety over another for any definite purpose is quite manifest. In order to illustrate this point allow me to draw the attention of the reader to the superiority for a silo of Hendersons' Eureka as compared with the New Century Wonder; Cloud's Early Yellow or the Mastadon Dent with Rennie's Improved Leaming; and the Salzer's North Dakota with the Canadian Yellow. The reader can in a similar manner make many comparisons between the different varieties and thus determine for himself the most promising kinds for him to test on his own farm in order that he may find out the variety which will best meet his requirements.

Eight different strains of the White Cap Yellow Dent corn have been obtained from different growers who have been continuously selecting seed and who have been growing the same variety of corn on their farms in Essex, Elgin and Middlesex. Some of these have been tested on the Experimental Grounds for two and some for three years in succession. The results are quite interesting and show quite a variation among the different strains. The greatest yields of total crop have been produced from seed obtained from Mr. H. Smith of Elgin County. Mr. C. Weigle and Mr. C. F. Knight of Elgin County and from Mr. E. M. Zavitz of Middlesex County. The corn of Mr. Smith and Mr. Weigle was, however, quite late in ripening. The greatest yield of grain per acre was produced from seed obtained from Mr. C. F. Knight of Essex County and from Mr. E. M. Zavitz, Middlesex County.

Sorghum for Fodder.

We include, under Sorghum, a number of classes as well as a number of varieties of crops which are grown quite extensively in some of the States

of the American Union, but only as yet to a very limited extent in Ontario. We include under this heading different varieties of sugar cane, broom corn, kaffir corn, millo maize, etc. Some of these are used principally for the production of syrup, others for furnishing material for the manufacture of brooms and whisks, and others almost entirely for the production of food for culinary purposes, etc. All of the varieties, however, are more or less valuable as producers of food for farm animals. As a food for stock, the sorghums may be used as green fodder, as silage, as dry fodder, or as pasture. The sorghums practically all thrive well in a comparatively dry, hot season, when corn makes a slow growth. At the College, none of the varieties have been used for silage and only one, viz., the Early Amber Sugar Cane, has been used extensively for pasture purposes. For the production of fodder, however, no less than sixteen varieties were under experiment in 1907. Of this number, fifteen varieties have been grown in the Experimental department for at least six years in succession. The seed is planted each year in squares by placing about five seeds in a place and allowing 3⅓ links (26 2-5 inches) between the different plantings. When the sorghum is about five inches in height, some of the plants are removed, allowing three to remain in each place. The sorghum is cultivated in about the same way as corn. All the varieties were cut in October before being injured by frost. The folowing gives the height, the yield of heads, and the total yield of green crop per acre of each variety for 1907 and for the average of six years.

Varieties.	Heigat.		Yield of heads per acre.		Total yield per acre.	
	1907	Average 6 years 1902-07.	1907	Average 6 years 1902-07.	1907	Average 6 years 1902-07.
	inches	inches	tons	tons	tons	tons
Orange Sugar Cane.....	114	101	.5	.4	20.8	21.0
Early Minnesota Sugar Cane	116	107	.8	1.0	13.0	19.1
Early Amber Sugar Cane...	108	97	1.5	1.1	17.8	18.6
Fodder Sugar Cane.....	119	101	.9	.9	19.6	18 2
Folger Sugar Cane	118	102	.6	.6	17.4	16.7
Kenney's Improved Amber Sugar Cane.....	122	105	.3	1.0	24.2	16.2
Kaffir Corn.....	80	68	.5	.6	12.9	13.7
Cal. Golden Broom Corn...	128	116	1.7	1.8	12.5	12.8
Early Jap. Broom Corn	118	112	1.7	1.8	11.4	11.8
Im. Evergreen Broom Corn	115	113	1.6	1.5	11.7	11.3
Dwarf Broom Corn	120	111	2.4	1.9	12.4	11.0
Yellow Millo Maize.....	86	73	.9	.8	12.2	10.5
Australian Broom Corn	107	95	2.2	1.7	8.7	9.4
Brown Dhoura Corn	76	71	1.0	.8	13.5	8.5
Jerusalem Corn.....	74	65	.7	.8	5.3	8.5

From the table here presented, it will be seen that all of the varieties of sugar cane gave a greater yield of green crop per acre than any of the other sorghuns under experiment. The Early Amber sugar cane, which is probably the best known variety throughout Ontario, gave an average of 18.6 tons. which is third in the list in the production of green fodder. The Kenney's Improved Amber sugar cane, although the tallest variety, gave the lowest yield of green crop of the different varieties of sugar cane which

were included in the experiment. The record of this variety in 1907, however, was exceptionally high, being upwards of 24 tons of green fodder per acre. The Kaffir corn, on behalf of which extravagant claims are sometimes made through the public press, stands seventh in yield of green crop per acre and has given an average of 7.3 tons per acre per annum less than the Orange sugar cane. The Early Amber variety is comparatively early and can usually be ripened satisfactorily on the warmer soils of the Province. It is rather earlier than the Orange sugar cane and is about the same in this respect as the Early Minnesota variety.

Sunflowers for Fodder.

A few years ago, considerable was said regarding the advisability of growing sunflowers and using the heads for cutting with corn for the silo. The crop has never come into general use for this purpose, although it is grown to a limited extent on some farms throughout the Province. Seven varieties were grown in the Experimental department for several years in succession and careful notes were made regarding the productiveness and the growth of the different kinds. Ultimately, all the varieties but three were discarded. These have now been grown for twelve years in succession. The following table gives the height and the yield of heads and of total green crop per acre for 1907, and for the average of twelve years.

Varieties.	Height.		Yields of heads per acre.		Total yield per acre.	
	1907.	Average 12 years.	1907.	Average 12 years.	1907.	Average 12 years.
	inches.	inches.	tons.	tons.	tons.	tons.
Black Giant	99	99	6.3	6.0	21.5	**20.6**
Mammoth Russian	89	93	5.7	5.5	16.7	**16.4**
White Beauty*	85	84	6.1	5.8	17.9	**16.3**

* Grown for ten years only.

The Black Giant has not only produced the greatest total yield per acre, but it has also furnished the tallest plants and the greatest weight of heads. In size of heads, however, the Black Giant is rather the lowest, the following being the average diameter of the heads of each variety in the results for seven years: Black Giant, 7.3 inches; Mammoth Russian, 7.5 inches; and White Beauty, 7.6 inches.

Varieties of Millet for Green Fodder and for Hay.

Millet is grown extensively in Siberia, India, Japan and China, where the seed is used largely as a human food. It is estimated that the seed of millet in one form or another is used as a portion of the food of fully one-third of the inhabitants of the globe. In Ontario, however, its general use

is for the production of green fodder or of hay. Some farmers grow millet more or less extensively as a regular crop, but as a rule it is sown to supplement some other crop, which, for some cause or other has proven a partial failure. It is found that in some seasons the amount of rainfall is so abundant during the latter part of May and the early part of June, that it is impossible to get corn planted in good condition, in which case the land can frequently be used to good advantage in growing millet, as it does not require to be sown until comparatively late in the season. In this way the loss of the corn crop would not be felt so seriously as it would have been had not a fodder crop been secured from the land. It will therefore be readily seen that the millet crop is frequently an important one for the farmers of Ontario, as it can be used very readily when other coarse fodder is apt to be deficient.

Previous to 1902 upwards of thirty varieties of millet had been grown under experiment at the College, for the purpose of gaining information as to the most suitable kind for cultivation in this Province. At that time it was reported that for the average results for eight consecutive years the highest yields of green crop were produced from the Golden Wonder, Holy Terror Gold Mine, Japanese Panicle, Japanese Barnyard, and Magic varieties. In 1902, and since that date, fifteen varieties have been grown in each of the six years, the results of which are embodied in the accompanying table.

Varieties.	Height (ins.)		Tons per acre.			
			Green fodder.		Hay.	
	1907	Average 6 years 1902-07.	1907	Average 6 years 1902-07.	1907	Average 6 years
Golden Wonder	30	36	6.5	9.3	3.1	4.1
Japanese Panicle	40	44	7.1	9.6	3.5	4.0
Holy Terror Gold Mine	28	35	6.6	8.8	3.2	4.0
Magic	33	36	6.7	8.6	3.3	3.9
Common	29	34	5.2	7.5	2.6	3.4
Japanese Common	31	34	7.9	8.7	3.5	3.2
Hungarian Grass	27	33	6.7	8.2	2.9	3.2
Siberian	30	34	6.3	7.8	2.9	3.0
Japanese Barnyard	25	40	4.0	8.6	1.7	2.9
California	28	34	5.2	7.8	2.5	2.9
Early Harvest	31	36	5.1	7.3	2.4	2.9
German or Golden	28	34	5.1	7.3	2.4	2.7
Hog	40	39	5.3	7.0	2.7	2.5
White French	30	34	4.3	5.4	1.9	2.0
Red French	24	27	3.9	4.5	1.4	1.4
Steel Trust	26	.....	5.8	.....	2.9	.....
Early Fortune	21	.....	3.3	.....	1.4	.....

It will be seen that most of the varieties which gave the highest yields of green fodder per acre in the eight years previous to 1902, also occupy highest places in yield of green fodder in the average results for the past six years. In hay production, the Golden Wonder, Japanese Panicle and

Holy Terror Gold Mine, each produced fully four tons per acre per annum. The Common millet gave three-fifths of a ton and the Hungarian grass four-fifths of a ton per acre less than the three highest yielding varieties. The Japanese Panicle is probably the most popular variety amongst the newer sorts which have been tested by the farmers throughout Ontario. It grows to a good height, stands up remarkably well, has a good leaf development, and is relished well by farm stock. It is a good producer of seed as well as a heavy yielder of green fodder and of hay. There has evidently been a great misunderstanding amongst seedsmen as to the different varieties of Japanese millet, as a number of the seedsmen in advertising the Japanese millet have illustrated one variety and have described another variety which is entirely different. It should be clearly understood that the seed of the Japanese Panicle variety is of dark reddish brown color and is very smooth and shiny, which is quite different in appearance from the seed of the Japanese Barnyard millet. The Steel Trust and the Early Fortune millets, which were grown in 1907 for the first time, gave comparatively low yields of hay.

Dates of Sowing Millet.

In each of the past two years an experiment has been conducted, in order to glean some information as to the best time to sow millet seed for the production of green fodder and hay. For this experiment, the Japanese Panicle, the Japanese Barnyard and the Hungarian Grass were the varieties used. The first seeding took place in each year on the 2nd of May and the succeeding seedings every half-month, until in all seven sowings were made. It was difficult to make hay out of the crops produced from the late seedings, especially in the case of the Japanese Panicle variety. The folowing table gives the average yield of green crop per acre produced in 1906 and in 1907 by each of the varieties from the different dates of seeding.

Dates of seeding.	Average number of tons of green crop per acre.			
	Japanese Panicle.	Japanese Barnyard.	Hungarian Grass.	Average 3 varieties.
May 2nd	8.82	8.00	6.78	7.87
May 15th	8.56	8.24	7.14	7.98
June 1st	10.80	9.32	7.40	9.17
June 15th	10.68	8.84	7.66	9.06
July 2nd	9.60	9.48	8.18	9.09
July 15th	10.68	8.48	8.40	9.19
August 1st	.....	.....	4.28	.....

It will be seen that there is a possibility of sowing each of these varieties of millets at too early a date to give the most satisfactory returns. The highest average yield of green crop per acre was produced by the Japanese Panicle millet when sown on the 1st of June; from the Japanese Barnyard millet, when sown about the end of June; and from the Hungarian Grass, when sown about the middle of July. The average results of the three varieties of millet tested on the different dates for two years in

succession are practically equal as far as yield per acre is concerned, for all of the seedings from the first of June until the 15th of July. The crops produced from the seed which was sown in May were light, and those from August were very poor. This experiment will likely be continued in the future in order to obtain results throughout a greater series of years.

Rape, Kale, Cabbage, Etc.

Rape, for pasture purposes, is quite well and favorably known by some of the stock men throughout Ontario. Other somewhat similar crops, however, such as the large feeding cabbages, the different kinds of kale, the cultivated mustards, etc., are not so well known and have been but little grown in Ontario. Some of these are used more extensively in Great Britain. In 1907, no less than thirty varieties representing this class of crops, were grown in the Experimental department. Of this number, twenty-eight have been under experiment for four years and thirteen varieties for eight years in succession. The crops have all been sown in rows 3½ links (26 two-fifths inches) apart. Each plot was exactly one-hundredth of an acre in size, consisting of three rows each four rods in length. The seed was sown at the rate of 2.2 pounds per acre. In order to give all varieties an equal chance, the plants in the rows were thinned to exactly two inches apart in every case. The land between the rows was cultivated occasionally throughout the early part of the growing season. The usual time of seeding is about the middle of June, the date in 1907 being June 18th. When the crops had reached about their best condition for feeding in the autumn, each crop was cut with a scythe and weighed in the green condition. The crop is usually fed either to sheep or to hogs and sometimes to young cattle. In England, the cabbage seed is frequently sown in the garden or in hot beds and the young plants are transplanted in the field at sufficient distances apart to produce large heads of cabbage. This, however, requires a greater amount of labor, which is an important item in connection with agriculture in Ontario at the present time. In this experiment the different varieties of cabbages have been treated in exactly the same way as the different varieties of rape and kale. The heads of cabbage have, therefore, been quite small, the growth being mostly leaf and stem. The quality, however, of these crops appears to be very good. The following gives the average yield per acre of thirteen varieties grown for eight years in succession:—

Sutton's Earliest Drumhead Cabbage	24.8	tons per acre.
Thousand Headed Kale	22.6	"
Dwarf Victoria Rape	21.0	"
Dwarf Essex Rape	20.7	"
Sutton's Earliest Sheepfold Cabbage	20.0	"
Purple Sprouting Broccoli	19.7	"
Marrow Collards	19.1	"
Hardy Curled Kale	18.8	"
Sutton's Best of all Savoy Cabbage	18.7	"
Jersey Kale	17.8	"
Tall Green Curled Scotch Kale	15.9	"
Sutton's Latest Drumhead Cabbage	14.9	"
Brussels Sprouts	14.5	"

As the results for the past four years included several varieties which were grown in 1904 for the first time, we also present a table giving both the height and the yield of green fodder per acre for 1907, and for the average of the past four years.

Varieties.	Height (ins.)		Tons of green fodder per acre.	
	1907	Average 4 years 1904-07.	1907	Average 4 years 1904-07.
Sutton's Earliest Drumhead Cabbage	20	19	42.0	29.6
Thousand Headed Kale	43	35	41.4	27.1
Sutton's Giant Drumhead Cabbage	21	21	35.2	26.4
Sutton's Earliest Sheepfold "	19	18	33.3	25.2
Large Seeded Umbrella Rape	32	27	35.0	24.7
Large Seeded Common Rape	36	30	34.8	24.4
Large Seeded Yellow Flowering Rape	37	28	38.3	24.1
Marrow Collards	26	24	30.8	23.0
Sutton's Best of All Savoy Cabbage	22	19	31.0	22.5
Dwarf Essex Rape	40	28	33.1	22.1
Dwarf Victoria Rape	37	29	37.3	22.0
Buckbee's Wonderful Dwarf Bonanza Rape	37	30	36.0	21.9
Large Seeded White Flowering Rape	39	30	31.4	21.6
Purple Sprouting Boroccoli	36	31	28.2	21.3
Sutton's Drumhead Cabbage	19	19	28.6	20.9
Cabbage Leaf Rape	41	32	33.8	20.5
Hardy Curled Kale	34	27	29.9	20.3
Jersey Kale	37	32	27.0	19.8
Tall Green Curled Scotch Kale	36	29	26.2	19.3
Sutton's Latest Drumhead Cabbage	23	20	26.8	18.9
Brussel's Sprouts	31	26	21.5	17.1
New Chinese Mustard	78	62	21.6	16.6
Bloomsdale Large Leaf Mustard	80	61	21.5	16.4
Southern Giant Curled Mustard	66	52	22.5	14.5
White Mustard	63	57	20.0	13.9
Creole Mustard	67	53	18.8	13.5
Brown Mustard	75	60	15.3	10.0
German Rape	20	30	8.0	5.9

It will be observed from the table giving the average results for four years, that of the four highest yielding varieties, three of them were cabbages. It will be seen that the Sutton's Earliest Drumhead cabbage gave an average of exactly 7½ tons per acre per annum more than the Dwarf Essex Rape. It will also be observed that the Dwarf Essex, and the Dwarf Victoria, and the Buckbee's Wonderful Dwarf Bonanza rape gave very similar results, and their appearance as well as their comparative yields are very similar. It will also be noticed that all the mustards have given comparatively low yields per acre, as they come in a group at the bottom of the list, with the exception of the German rape, which produced the lowest yield of all the varieties under experiment. It should be remembered that the German rape, as well as the different varieties of mustard, are annuals rather than biennials, thus coming into bloom in the same year in which the seed is sown, and are in this respect quite different from the other varieties included in the list here presented which produce leaf and stem but no bloom the first year.

Two other varieties; viz., the Dwarf Holstein and the World Beater cabbage, were grown in 1907 for the first time, the former giving a yield of 28 and the latter a yield of 42 tons of green crop a per acre. It will, therefore, be seen that the World Beater variety of cabbage, which was grown in 1907, gave equally good results with the Sutton's Earliest Drumhead cabbage, which stands at the head of the list in the average results of twenty-eight varieties for four years, as well as of thirteen varieties for eight years.

Leguminous Crops for Green Fodder.

Eighteen varieties of leguminous crops were grown in the Experimental department in 1907 for the production of green fodder. They include vetches, soy beans, cow peas, lupines, etc. Most of the varieties in each of these classes require a fairly long season for growth and are more suitable for a warmer climate than that of Ontario. Owing to the peculiar weather conditions of the past season, the results were unusually low and somewhat peculiar. The greatest yields of green crop in 1907 were produced as follows: Medium Green soy beans, 6.9 tons; Ito San soy beans, 5.6 tons; Grass peas, 5.4 tons; Hairy vetches, 4.3 tons; and Parnell's Prolific cow peas, 4 tons per acre.

As six of the varieties belonging to this class have been grown in each of the past seven years, the average results for those seven years are of decidedly greater value than the results for 1907. The following table gives the average height and the average yield of green fodder per acre for each of the six varieties of leguminous crops, grown for seven years in succession.

Medium Green Soy Beans	34 inches	9.4 tons.
Hairy Vetches	33 "	8.2 "
Grass Peas	37 "	7.3 "
Early Yellow Soy Beans	26 "	7.2 "
Wonderful Cow Peas	17 "	6.0 "
Whip-poor-will Cow Peas	15 "	5.2 "

The Hairy vetches can either be sown in the autumn or in the spring of the year. It is rather difficult to grow seed of the Hairy vetches in Ontario, and as most of the seed is imported from Germany it is rather expensive, frequently costing five or six dollars per bushel. The Early Yellow Soy Beans generally ripen well in Ontario and yield about 18 bushels of grain per acre, the grain being exceedingly high in nutritive properties.

Red Clover.

Red Clover is to Ontario what Alfalfa is to some of the Western States. and the Cow Pea to the Southern States of the American Union. Ontario farmers should be very careful to make the best possible use of the red clover in connection with their short rotations. It is a plant of exceedingly great value, as it produces heavy crops of exceptionally nutritive material for farm stock, and also assists largely in the improvement of the soil by appropriating free nitrogen of the atmosphere, securing valuable fertilizing elements from the subsoil, and by greatly improving the mechanical condition of the soil at the surface. In some respects there is no other plant which can exactly take the place of clover on the farms of Ontario. Great care, therefore, should be taken in the endeavour to make the conditions very favorable for a good catch of clover when the seed is sown. On some farms in Ontario, it seems as though grain crops have been grown so extensively that the humus in the soil has become very deficient, and that it is now difficult to secure a good growth of clover. I believe, however, it is still possible to bring practically every farm in Ontario into that condition in which the red clover can still be grown successfully, unless in exceptional years when the crop becomes destroyed through unfavorable conditions of the weather.

In order to secure information regarding the different strains of red clover, no less than thirty-four different lots were obtained and were sown in duplicate in the Experimental department. These were obtained from different parts of the world through different sources. A large number were

obtained through the Department of Agriculture at Washington: others were obtained through the seed branch of the Department of Agriculture at Ottawa, and others were obtained direct by the Experimental department at the College. These clovers included different strains of both the Common Red and the Mammoth Red varieties. The results of the experiment show that of the foreign strains, the highest yields of hay were produced from seed obtained from Ufa and from Orel, both in Russia. The Orel, which was also tested along with a number of other varieties at several of the American experiment stations through the co-operation of the United States Department of Agriculture, gave very good results indeed. In fact, the records were so satisfactory that the Bureau of Plant Industry of the Department of Agriculture at Washington, issued a special bulletin entitled: "A New Type of Red Clover." In regard to this clover, I make the following quotations from the bulletin referred to:

"In the course of an extensive experiment with seed from different sources, there appeared a variety, hitherto not used in the United States, possessing certain advantageous qualities which make it desirable to introduce it into American farming. The seed of this variety was secured from the "black earth" region in the Eastern part of the Orel Government of Russia. The soil and climate of this section resemble strikingly those of our North Western prairie country.

"This variety is distinguished by the dustlessness of its hay, due to almost complete absence of hairiness from all parts of the plant, by its heavy yields for the first crop, by its leafiness and the persistence of the basal leaves, by the succulence of the stems, which improves greatly the quality of the hay and reduces the waste, due to woody inedible portions, by greater palatability than hay from domestic seed, and by the fact that it comes to proper maturity for harvesting from ten days to two weeks later than the ordinary American red clover. Except in certain sections and for certain purposes, this variety is not recommended for supplanting domestic red clover, but rather for supplementing the latter. Although the hairless Orel clover can be readily distinguished from the American form on the field, there is no apparent difference in the seed."

We learn that the temperature and the rainfall for the summer months at Orel, Russia, are very similar to those of Ontario. The Orel clover in the experiments at Guelph resembles quite closely the variety which has been grown more or less in this Province under the name of Mammoth Red. The Orel clover, however, appears to be rather more hardy than any other strain of clover which we have tested at Guelph. There were still a few living plants in the summer of 1907, which was the fourth season after the seed was sown. We are pleased to state that we obtained a small quantity of seed from the plants which were still surviving this season. We expect to sow this seed in the spring of 1908 and shall watch the results with interest. We also received fresh seed through the Department of Agriculture in the spring of 1907 and have now some very fine plots of both the Orel and the Ufa clovers, which should give us some interesting results in 1908.

Lucerne or Alfalfa.

The cultivation of Lucerne throughout Ontario is probably increasing from year to year. In those sections of the Province where it can be grown successfully, it is an exceedingly important crop. It probably thrives best on a deep rich loam which contains a fair percentage of lime and which is either naturally or artifically well under-drained. It will generally thrive well, however, on soil of almost any character, providing the subsoil contains

no stagnant water. We have sown lucerne seed in an experimental way at the College in each of fully twenty years. The catch is nearly always good and the crop grows quite satisfactorily. We have sown lucerne both alone and with a nurse crop with good success. Although we have had good catches when the lucerne seed has been sown with winter wheat, spring wheat, oats and barley, we generally prefer to sow with about a bushel of barley per acre as a nurse crop. When sown without a grain crop the plants should be cut at a good height two or three times during the summer and the material should be allowed to remain on the land. No hay should be made from lucerne during the first year unless the growth is exceptionally large. We have sown lucerne seed both in the autumn and in the spring of the year, but have in practically all cases obtained the best satisfaction from the spring sowing. We prefer using about twenty pounds of lucerne seed per acre.

On several occasions we have tested untreated seed with that which was treated with the nodule forming bacteria, but have as yet observed no perceptible advantage from innoculation. This is probably owing to the fact that the soil already contains a sufficient quantity of the living organisims.

The lucerne crop is used for green fodder, for hay, and sometimes for pasture. It is an admirable crop to use for green fodder or hay, as it supplies a large amount of feed of excellent quality. It should always be cut, however, before more than one-tenth or at most one-third of the blossoms have made their appearance. At this stage the crop produces its maximum amount of valuable food constituents, after which it rapidly deteriorates both in digestibility and in palatability. When lucerne is grown alone for pasture purposes, great care should be exercised when first turning on the animals in order to prevent bloating. It is always wise to avoid pasturing lucerne close to the ground as the crop is easily ruined by close grazing, as the root crowns of the plants are quite prominent and are easily eaten off by the animals, especially on soils that cause the plants to heave. In the spring of 1905, lucerne seed from various countries of the world was obtained through the Department of Agriculture at Washington. This seed, along with other strains obtained in Ontario and the United States, were sown in the spring of the year, and the growth from each was carefully examined and weighed in each of the past two years. Some of the strains proved to be entirely valueless for Ontario, while others gave very promising results. The seed obtained from Khiva, Samarkand and Sairam of the Eastern countries, and from Texas, Northern Montana and Nebraska of the States of the American Union, furnished the highest yields of hay per acre. This experiment will likely be followed up from year to year with the object of securing seed from that source which is likely to furnish the very best results. Turkestan alfalfa grown from seed obtained in our own markets has not as yet given very good satisfaction at Guelph, even though it has been very highly recommended in some parts of America.

The results of all the work conducted at the College show that over a series of years we usually obtain about twenty tons of green lucerne, or about five tons of hay per acre per annum. With care, the crop can be cured so as to furnish a large amount of hay of excellent quality.

Timothy.

Timothy has been grown in Ontario very extensively for the production of both hay and pasture. As a pasture crop, however, it gives very poor results in a hot, dry time in the summer when the pasture is needed the most.

A large amount of experimental work has been conducted at the College in comparing Timothy with other grasses, such as Meadow Fescue, Orchard grass, Tall Oat grass, Awnless Brome grass, Meadow Foxtail, Red Top, Canadian Blue grass, Kentucky Blue grass, etc., and the reports have been presented from time to time. For the first time in 1907, however, an experiment was started in order to ascertain the comparative results of different strains or varieties of timothy. Several years ago Dr. Hopkins, formerly of the Agricultural Experiment Station at Morgantown, West Virginia, carried on some very extensive work in starting new strains of timothy from selected plants. From a very large number of selections which Dr. Hopkins made, he finally chose three as among the very best for fulfilling certain requirements. These Timothys are now being more extensively tested at the Arlington Experimental Farm near Washington, and the results are promising. It is claimed that one of the timothys ripens early and is very suitable for sowing with red clover, as the two crops reach the proper stage for cutting at about the same time. Another strain is said to be particularly suitable for pasture purposes, and still another is supposed to be a particularly heavy yielder. When in Washington in the autumn of 1906, I secured a small quantity of seed of each of these strains and in the spring of the present year we sowed each kind in duplicate plots. The germination was very good and the plots are quite promising. We shall watch with interest the results of these three strains, viz., Early Timothy, Pasture Timothy, and Stewart's Mammoth Timothy, in comparison with the ordinary variety which has been grown in Ontario so extensively for many years past.

Annual Pasture Crops.

Although an average of about seventy thousand acres is added annually to the pasture lands of Ontario, it is quite probable that the pasture crops in 1908 will be inadequate to furnish the desired amount of pasture. Many farmers seed their grain crops with Timothy and Common Red clover with the expectation of using the crop for hay and for pasture for a period of two years, and then of plowing the land for some other crops. Owing to the scarcity of labor, however, the sod is often allowed to remain several years before being plowed, and as a result, many of the pastures of Ontario are principally Timothy sods of four, or five, or six years' standing. In dry seasons, the Timothy forms a very poor pasture crop. This fact was realized in many parts of Ontario during the dry season of 1907. In some sections of Ontario farm stock had to be sold at exceedingly low prices, owing to the deficiency of pasture and of fodder crops. Great care should be taken in the spring of the coming year to furnish a considerable amount of rough feed, in order to prevent a re-occurrence of the experience of the past season. A good supply of corn should be planted, and mixed grains for either green or dry fodder should be sown. It is also quite possible that a number of farmers may wish to sow some crop in the spring of the year which would furnish a pasture in the same year in which the seed is sown. In order to get some information on this very question, a line of experimental work was started in the spring of 1900, with the object of finding out which one of a number of annual crops would give the best results when used for pasture, as soon as possible after the seed was sown. An experiment with fourteen varieties was conducted at the College for a period of five years. In each of the years, the crops were sown in three separate sets, there being fourteen plots in each set; thus making in all a total of forty-two plots each season. All the plots were sown each year on the same day and under similar conditions. The seed was sown in May in each of the five seasons. The three sets were handled in each year as follows:—

Set 1. The crops on all the plots in set 1 were cut at the end of six, nine, twelve, fifteen, and eighteen weeks after the seed was sown; thus making five cuttings for each crop. Each cutting was weighed in the green state, and also after it was dried in the form of hay.

Set 2. Each crop was cut when it was thought to contain the greatest bulk of best quality of green fodder. In order to ascertain the amount of after-growth, another cutting was also made from each crop later in the season.

Set 3. A hurdle fence was placed around a set of fourteen plots and cattle were turned on the plots daily until the pasture was all eaten. The pasturing usually took place in the latter part of June. Careful notes were taken of the amount eaten of each crop daily. After the crops were pastured the first time, they were allowed to remain unpastured until they were again ready for pasturing, when the cattle were turned in and similar notes as on the previous occasion were taken.

The amount of pasture crop produced by the various varieties when grown separately, was according to the following order, starting with the highest and finishing with the lowest yielders: Oats, Common Red Clover, Hairy Vetches, Sugar Cane, Dwarf Essex Rape, Crimson Clover, Rye, Barley, Hungarian Grass, Common Vetches, Corn, Spring Wheat and Soy Beans.

As the different varieties, when grown separately, were ready for pasturing at different seasons of the year and possessed different characteristics of growth, it was thought that better results would likely be obtained from a mixture than from any one crop by itself. In the spring of 1904, therefore, another experiment was started, in order to test the value of these different mixtures of crops which could be sown in the spring to be used as pasture in the same season. Of the six mixtures used up to date, the one which has given the best general satisfaction is as follows:—Siberian Oats, 51 lbs.; Early Amber Sugar Cane, 30 lbs.; and Common Red Clover, 7 lbs. per acre; thus making a total of 88 pounds of seed per acre. The average amount of pasture produced by this mixture has been 10.7 tons per anunm. This crop is usually ready for pasture in six weeks after the seed is sown, although in the spring of 1907, owing to the very cold backward spring, it was about seven weeks before the growth had reached the best condition for pasturing purposes. The crop is relished by the animals. As the oats thrive the best in the early part of the season, the Early Amber Sugar Cane somewhat later, and the Common Red Clover towards the autumn, the pasture holds out very well throughout the entire season. In each of the years in which this experiment has been conducted, there was an excellent coating of clover on the land in the autumn ready to come through the winter and produce a clover crop in the following year. In fact, it is believed that a catch of clover can sometimes be obtained in this way when it would have been difficult to have obtained a good catch if the clover seed had been sown with some cereal which was allowed to grow to maturity.

In 1906, about seven acres and in 1907, about eight acres of this mixture were sown in the Experimental department and pastured with steers until it was necessary to plow the land for the experiments with winter wheat. The land was capable of carrying more than one animal per acre and the steers thrived well, making good gains in each season. The soil on which the steers were pastured was what might be termed an average clay loam. No serious results were observed from the tramping of the animals. It is quite possible that on a heavy clay soil, and especially in a wet season, a crop of this kind could not be grown and pastured with as good satisfaction as has been obtained on the land here described.

Clovers and Grasses for Pasture Purposes.

In the spring of 1906, twenty-one mixtures of grasses and clovers were sown in duplicate with a grain crop. In 1907, the crops produced were exceedingly interesting and were studied by thousands of farmers who visited the College in connection with the June excursions. One of these sets of mixtures was used for the production of hay and the other for the production of pasture. The results show that the greatest amount of pasture was produced by a mixture of Lucerne and Tall Oat Grass, and the highest yields of hay were produced from Lucerne with either Tall Oat or some other variety of grass. We hope to be able to give fuller information on this subject in the near future.

Mixtures of Grasses and Clovers for Permanent Pasture.

A large amount of experimental work has been done in testing varieties of grasses and clovers, both singly and in combination within the past thirty years. The grasses and clovers have been carefully studied and much information has been gleaned in regard to their value for hay and also for pasture. In 1885, Prof. Wm. Brown, who was then Farm Superintendent at the Ontario Agricultural College, recommended a mixture which he thought well adapted for a permanent pasture. Only the most hardy varieties which had been tested at that time were included in the mixture. In 1893, after eight years of additional experimental work, during which time the writer was closely connected with the work of the Experimental department, another mixture was recommended, containing a smaller number of varieties and requiring a smaller amount of seed per acre. The grasses and clovers recommended in 1893, have proven themselves to be a valuable mixture. They are all hardy varieties and when grown together give a large amount of pasture. An experiment was started in the spring of 1894 by sowing a plot of the mixture which was recommended in 1885 and a plot of the mixture which was recommended in 1893. During eleven years, no less than twenty-six cuttings were obtained, as from two to three cuttings were furnished each season. The average annual yield of hay per acre produced from the crop recommended in 1893 was 5.1 tons, and from the mixture recommended in 1885, 4.4 tons per acre. The figures presented in this report show the comparative yields of hay from the two mixtures. They also show that the grasses used for this mixture are very suitable for an average soil in Ontario. These mixtures can be used for the production of either hay or pasture, but are more suitable for pasture purposes owing to the unevenness in the maturity of the different varieties, which is a detriment to hay production but an advantage when a crop is used for pasture purposes. We here name all the varieties of grasses and clovers sown in the best mixture and also the quantity of seed per acre, in order to furnish a guide for any person who wishes to know the quantity of seed per acre of the different varieties which are recommended as a permanent pasture mixture for an average Ontario soil. The mixture is as follows: Orchard Grass, 4 lbs.; Meadow Fescue, 4 lbs.; Tall Oat Grass, 3 lbs.; Timothy, 2 lbs.; Meadow Foxtail, 2 lbs.; Lucerne, 5 lbs.; Alsike Clover, 2 lbs.; White or Dutch, 1 lb.; Yellow Trefoil, 1 lb. This makes a seeding of 15 pounds of grass and 9 pounds of clover, or a total of 24 pounds per acre. For average conditions it would probably be as well to omit the Yellow Clover or Trefoil and add another pound of White Clover. On cold wet land the five pounds of Alfalfa might be replaced by four pounds of Red Top. Such a mixture of grasses and clovers can often be used to

Cutting and binding Winter Wheat on the Plots.

Eleven steers pasturing on an eight acre field sown in the early part of May, 1907, with a mixture of 51 lbs. of Oats, 30 lbs. of Early Amber Sugar Cane and 7 lbs. of Red Clover Seed per acre.

A partial view of experimental plots of potatoes, sugar beets and corn.

excellent advantage on fields located on hillsides, or a long distance from buildings, or which are not required for a short rotation, but on which it is desirable to have a permanent pasture which will furnish a large amount of feed of good quality and especially which will furnish a pasture crop in the dry hot time in summer, when the Timothy fields are apt to become greatly parched and almost barren.

A few of the 33,000 farmers who visited the College in the month of June, 1907.

In conclusion, I wish most heartily to thank yourself, and through you, the Minister of Agriculture for the kindly support given me in the work of the department of Field Husbandry during the past year.

Respectfully submitted,

C. A. ZAVITZ.

PART XIV.

THE LECTURER IN FORESTRY.

To the President of the Ontario Agricultural College.

SIR,—I have the honor to present herewith the report of the Forestry department for the year 1907.

The courses of lectures as outlined in the College Calendar have been delivered to the second and fourth year students. The courses could be made of more value if more time could be allowed in the fall term for trips to the woodlots and plantations where practical demonstrations could be made.

COLLEGE WOODLOTS AND PLANTATIONS.

While the greater portion of the department's labor is expended is nursery work, every available opportunity is taken to improve the condition of the college woodlots and plantations.

In the south woodlot, an open space about two acres in extent, has been planted with White Pine (*Pinus strobus*). Experiments in width of planting, autumn planting and mixtures of species, are being tried on this area.

Fig. 1. Planting open area in College woodlot with White Pine.

Scattered planting of White Pine has also been carried on in open places and in the borders of the north woodlot. This woodlot has been cleared of considerable dead material, weeds, etc., which made some parts almost impenetrable.

Owing to the condition of fences for keeping out stock, it has been felt unadvisable to do any planting in the Puslinch woodlot, although it is very open and in need of restocking with young growth.

In some of the early plantations, where too wide planting left the soil so exposed that sod formed, preparations have been made to try experiments in under-planting. In Europe under-planting is done with Beech, Silver Fir and Norway Spruce, and it is desirable to know which of our native trees will best answer this purpose.

In the autumn of 1906 (between 15th of September and 15th of October), Norway Spruce were set out about the borders of the south woodlot and plantations as an experiment in fall planting. Fall planting of evergreens has not been considered as safe as spring planting. The average planter has more time at his disposal about the end of September, and it is hoped that this planting will prove satisfactory. The Spruce set out in the fall of 1906 are doing very well and show that it is quite possible to do such planting. The work has been continued this fall (1907), with White Pine and Norway Spruce.

Nurseries.

The Holmwood nursery has been chiefly devoted to growing evergreens, as intimated in last year's report.

This season we imported from Germany:

200,000 2 year old White Pine.
50,000 3 " " " "
25,000 3 year old Norway Spruce.
25,000 3 " " European Larch.

Of the above shipment the White Pine came over in splendid shape but the Spruce and Larch were badly damaged.

We have at present in the Holmwood Nursery about

100,000 White Pine in seed beds.
175,000 3 year old White Pine.
15,000 4 " " " "
25,000 3 " " Scotch Pine.
15,000 3 year old Norway Spruce.
7,000 4 " " " "
5,000 2 " " Arbor Vitæ.

Fig. 2. Three year old White Pine in Holmwood Nursery.

This year fall planting is being tried with 20 lbs. of White Pine seed, and about 25 lbs. of Arbor Vitæ seed. The latter was collected in this district where there was a medium crop of seed, although the seed does not

appear to be high in germinating power. Many of the forest tree seeds were this year found to be abortive, which was probably due to the cold, backward spring.

The soil in the nursery is very low in plant food, especially on the side bordering the river where the plants were much weaker. This land being held under lease, it is difficult to make such permanent improvements as are required for proper nursery organization.

Considerable trouble has been found in a disease known as "damping off." One student is making a special study of this disease and it is to be hoped that we may find practical methods of overcoming it.

The greatest damage was done during warm, moist days on locations where the soil was weakest in plant food.

The College Nursery has been devoted to growing hardwoods and ornamental planting materials for the College grounds. There is in this nursery at present the following material:—

Black Locust	25,000	Butternut	3,000
White Ash	15,000	Black Walnut	
Tulip	10,000	Hickory	
Box Elder	12,000	Red Oak	
Hardy Catalpa	10,000	Chestnut	
Black Cherry	3,000		

In this nursery we are trying fall planting of Black Walnut, Burr Oak, Hickory, and Sweet Chestnut. It is difficult to grow Sweet Chestnut, as they are so easily injured by drying out or by moulding from too much moisture. The nuts for planting cost from three to six dollars per bushel, owing to the fact that they are in great demand on the city markets. This

Fig. 3. Planting wash sand land with Scotch and Jack Pine.

tree should be given more attention in southwestern Ontario where it thrives on sandy loam soils. One farmer who had a large number of trees scattered about the farm, received a revenue of $200 in 1906 from the sale of nuts.

It would facilitate the nursery work very much if suitable ground could be found large enough to join the two nurseries. As it is, the two grounds are so widely separated that buildings and other equipment must be more or less duplicated.

Co-Operative Planting.

The last season was particularly adverse to tree planting. Owing to the cold, backward spring the young plants were subjected to strong winds before they could establish themselves. After this followed an exceedingly dry summer, and some failures are to be expected. During the last season about two hundred thousand trees were sent out to applicants throughout the Province. The chief difficulty in this co-operative work will be in visiting the prospective planters' grounds and making planting plans. To carry out this work more assistance will be required. Officers doing this work should be able to give advice to woodlot owners and examine previous plantations in the district.

Some of the earlier plantations were visited and valuable data is being obtained. Planting done on waste sand land in 1905 (cut p. 222 of 1905 College Report), with White Pine and Norway Spruce, was examined. Throughout the White Pine has given better results, but on the worst parts some of the White Pine have been killed. This will be replanted with Scotch Pine and Black Locust, which it is found are better able to thrive on weak blow sand areas. In this plantation the White Pine are thriving wherever any protection is to be found. The first plantation made in Norfolk County was upon steep hillsides of heavy soil. White Pine was the chief tree used and about 95 per cent. of the trees are alive and doing well. This last season they averaged about eight inches of growth and are now above the grass and weeds.

One of the most promising trees for waste, sand types of soil is the Black Locust. It seems to withstand adverse conditions and should be of special interest to farmers with waste land propositions. Very extensive work has been done in Hungary with this tree, where it is estimated that they have about 200,000 acres of pure Locust forest in the form of plantations. The Agricultural Department encourages tree planting and sends out every year from five to six million Locust seedlings. This planting is done on soils which are absolutely worthless for agriculture, and the following tables* give results from some of the earlier plantations:—

Stand of Seeding Locust on Sample Plots of One Acre.

Plot.	Soil Quality.	Age.	Number of Trees.	Average diameter breasthigh.	Average height.
		Years.		Inches.	Feet.
a	Good	30	558	5.3	63
b	Best	31	512	7.5	60
c	Fair	30	594	4.3	38
d	Poor	30	288	3.0	20

*From Forestry Quarterly.

STAND OF SECOND-GROWTH LOCUST ON SAMPLE PLOTS OF ONE ACRE.

Plot.	Soil Quality.	Age.	Number of Trees.	Average diameter breasthigh	Average height.
		Years.		Inches.	Feet.
e	Fair	8	452	3.3	30
f	Good	15	643	4.3	47
g	Fair	15	391	3.7	33
h	Poor	15	324	2.3	20

These figures are for a district where the annual rainfall averages 21 inches and the temperature ranges from zero in winter to 95 degrees F. in summer. This district is very similar to southern Ontario, and the figures are of more value to us than any results obtained in the middle western states where planting has been done on good soils.

The first table where plots are of seedling origin, are 30 years old and would average 488 trees 5 inches in diameter and 45 feet high, estimating two fence posts to the tree we would have 976 posts at 20c a post, which would give a revenue of $195.20 or an annual, gross revenue of about $6.50, and this on non-agricultural soil.

Fig. 4. Blow sand forming dunes and destroying young Forest growth.

The second table which represents second-growth or coppice (meaning the sprout growth coming up from the stump after cutting), shows better results than the seedling plots.

The fact that this growth can be had on poor soil in from 15 to 30 years, makes this tree of value to the farmer. Black Locust at this age is chiefly of use for posts, vine stakes, poles, fuel and general farm work.

Waste Lands.

During the summer I have visited and roughly surveyed the large tracts of waste land in the southwestern part of Ontario, concerning which I am preparing a special report. There is in this old, agricultural portion of the Province, in the neighborhood of two hundred square miles of waste land. This so called waste land, in areas varying in size from 3,000 acres to 60 square miles, is sand formation and will not stand tilling and cropping. It originally produced splendid pine and should be devoted to forest purposes.

By segregating and reforesting these lands we would protect adjoining agricultural land from sand blows, assist in insuring a future wood supply, protect the sources of small streams and give employment to local people.

Respectfully submitted,

E. J. ZAVITZ.

PART XV.

THE MANAGER OF THE POULTRY DEPARTMENT.

To the President of the Ontario Agricultural College:

Sir,—I have the honor to submit herewith the report of the Poultry Department for the year 1907.

Teaching, as heretofore, includes the work with the regular College students, the short course students, the Farmers' Institutes, and the poultry shows. This part of the work scarcely needs a detailed report.

Much of our time, this year has been given to experiments in the hatching and the rearing of chickens. We have, in previous years, studied these problems, but this year we devoted nearly all our time to these very important and perplexing questions. A detailed report of the work done by this department, also that done by the Departments of Physics, Chemistry, and Bacteriology, has been printed in bulletin form. It is, therefore, unnecessary for me, at this time to report upon these experiments.

Poultry Houses.

In last year's report a general description was given of a long poultry house that had been constructed, for the purposes of testing hens as layers and as breeders in flocks of 50, 75, and 100. It is not wise for one to draw conclusions from one season's tests on a question such as this, and I shall, therefore, not go into the detailed results, but shall give a general summary of the results.

The egg production during the winter was best in the small pen of 50 birds, but for the balance of the season there was practically no difference in the egg yield. I do not consider the winter results very important, for the reason that we had some trouble with the health of birds in the larger flocks. We were short of a few females to make up the required number and purchased the same. The purchased birds appeared healthy when they arrived, and remained so for nearly three weeks, when some of them, placed in the two larger pens, developed chicken pox. This disease almost stopped egg production. The birds that developed very bad cases were killed and burned, but nearly all were successfully treated by burning the sores with caustic. We used Epsom salts freely, and plenty of lime was also used on the dropping boards. The eggs hatched well from all the pens, and if there was any difference it was in favor of the large pen. The fertility of the eggs was better from these flocks than any others on the entire plant.

The birds in this house were fed whole wheat in deep straw or litter early every morning, winter and summer. For part of the year the wheat was scattered in the litter after dark at night, so that very early in the morning the hens could go to work. We found this plan useful to us when we had more work to do, during daylight, than we could possibly get done.

Beef scrap and a dry mash composed of bran, shorts, oatmeal, and cornmeal of equal parts by measure were kept in hoppers constantly in front of the fowls. During the winter, roots or other green food

was given at noon and some alfalfa meal was mixed in the mash. We feed nothing at noon or night during the summer, depending entirely upon the hens eating what they wanted from the hoppers. The results were quite satisfactory, but during the winter and in October when the poor layers were replaced by pullets, we found it necessary to feed corn at night, as much as the birds would eat. Unless we feed our pullets plenty, they do not develop and lay when changed from free range to winter quarters. Our experience is that a hen must be in good condition as to flesh before she lays; we realize that some get too fat, but more get too little food.

The reports of 1905 and 1906 contained results of the experiments with four styles of poultry houses. These reports indicated that a warm, stuffy house was not as good for egg production, and further, the birds were not as healthy as in a house much colder, but better ventilated. The results of this year as to laying, hatching, etc., are the same as in previous years. The poultry house costing the most to build gave the poorest results.

Trap Nests.

The only way to know which hens are paying it to know which hens are laying. The trap-nest tells us this, but it takes time to release the hens and record the eggs. We have been able to keep the egg record of nearly 500 hens. For our incubator experiments it was necessary to have the eggs in each machine, laid by the same individual, so as to get uniform results, There can be no doubt that it pays us well to keep such records. The public buy a number of birds for breeding purposes, and many want males from our best layers. I believe it would pay the average farmer to know what hens lay during the winter months. Our records show that most winter layers make the best yearly records, and these are the birds to breed from. Their eggs may not hatch as many chickens, but they are worth more. We commence our year at December the first, and cull out the poor layers about the first of October. Where as low a standard as one hundred eggs is used fully fifty per cent. of the hens are culls. Many of the yearling hens have laid well. We have a few hens four and five years old that are still doing fairly well. Many of the hens that laid well during the winter months of 1905 and 1906 did as well in 1906 and 1907, or it would appear, so far as we have gone, that a pullet which lays well during her first winter is a likely winter layer for the next year, at least. We were rather surprised, when culling the flock in October, to find, that more of our poor layers had moulted better or earlier than the good layers. This applied as much to yearlings as to the pullets. The greatest layer of the flock was a yearling hen. She laid 210 eggs from Nov. 9th, 1906, to Nov. 1st, 1907. Most of the good laying hens moulted quickly, and several laid a few eggs while in heavy moult. We cannot as yet state that the eggs from heavy layers are poor for hatching purposes. We have started some very interesting experiments with individuals as to the number of eggs that hatch, and the general growth and development of the stock as well as egg production.

Growing Chickens.

Our experience is that in order to grow the best chickens at the least cost, and as quickly as possible, one must be careful to put them on new or untainted ground. We find year after year that where we raise chickens on new

ground, they grow faster and make larger birds. We have ground upon which chickens have been grown for nine or more years, and this season we placed chickens on this ground April 1st, and placed another flock of the same breeding on new ground, April 23rd. By October the chickens on the new ground were fully as well matured and were larger in size. The feeding was the same to both flocks. Most farm chickens have sufficient range so that this may not be a very serious matter, but to those who are growing many chickens, a rotation of crops is very desirable. We have grown good chickens in the cornfield and in the orchards. The more the land is cultivated or stirred, the better the chickens grow.

The importance of feeding little chicks green food in abundance is impressed upon us year by year. We now make a special effort to supply all the lettuce, rape, or other tender green food a chick will eat from the day it is hatched until it is at least, four to six weeks old, at which age they can run about and hunt for themselves. We do not put two broods of chicks on the same ground during one season, and further, June, and even July chicks will do very well when the green food is well supplied and the range is new. A little chick cannot get much green food from old tough grass.

We have, this year, fed the chickens from hoppers after they were four or five weeks old. A few chickens were so fed from the day they were hatched. This worked fairly well when the weather was fine and the range was large. The hoppers contained wheat and cracked corn, and for part of the chickens a hopper of mash, composed of bran, shorts, and cornmeal of equal parts, to which was added ten per cent. of beef scrap was supplied.

Fattening Chickens.

Owing to the high price of feeds, we made some changes in our ration for fattening the chickens. The cheapest, palatable ration we could find, locally, was one composed of equal parts of ground corn, low grade flour, and middlings. This mixture cost $1.30 per hundred pounds. The gains made by the birds were not equal to those made in previous seasons when oats and buckwheat were fed along with the corn, nor yet was the quality of flesh as good. The birds did not dress as white as we usually have them. Sour skim-milk or buttermilk was used for wetting the ground grains.

Many of the dealers of dressed poultry complain of the thin chickens that are sent to market, and I have noticed that on many of the local markets the birds offered for sale were anything but fleshy and the method of dressing was very bad. Scalded, thin chickens where the skin is mostly torn off are certainly unsightly and further, they decompose more quickly than those which are dry plucked. All birds offered for sale, where they have to be kept a few days, should be dry plucked.

It may be of interest to know what it costs to fatten chickens, and what the difference is between the cost price and the selling price. The following table gives the results in fattening 60 chickens hatched between June 15th and July 1st. The birds were reared in a corn-field and were put in the fattening crates October 1st. These were the cull birds, those that we did not want to use in our laying or breeding pens. We are keeping a number of June chickens as egg producers for 1908. There were 12 chickens of each of the following breeds: Barred Plymouth Rocks, White Plymouth Rocks, White Wyandottes, Buff Orpingtons and Rhode Island Reds. These chickens would have been worth not more than eight cents per pound live weight when

taken from the corn field. They were sold when fattened for twelve to fourteen cents per pound.

Weight when put in the crate, 181.5 lbs.
Weight after three weeks feeding, 252 lbs.
Grain consumed, 249.25 lbs.
Milk consumed, 517 lbs.
Cost of feed, $4.26.
Chickens cost at 8c. lb. live weight, $14.52.
Total cost, $18.78.
Dressed weight, 212.5.
Selling price at 12c. per pound, $25.50.
Profit, $6.72.

The profit on each chicken does not appear very large, yet at the same time, one must consider that there is a gain of $6.72 for the work, or we consider an amount over 50 cents per hour. This is not an unusual lot of chickens. Many chickens have made greater gains than were made in this trial. There is nothing in the trial, so far as I know, but what can be accomplished by anybody.

To market thin chickens is wasteful and it appears to me there is at least sufficient margin of profit to pay a reasonable wage.

We need a proper building for incubators. We now have no room large enough to hold the machines for the short course students, nor yet large enough for the experimental work.

Much of the work accomplished this year could not have been done without the faithful services of John R. Terry. The assistance of J. L. Woods and W. A. Brown during the summer months was very satisfactory.

I am also deeply indebted to the various departments of the College, who have assisted me in many ways.

Respectfully submitted,

W. R. GRAHAM.

PART XVI.

THE LECTURER IN ECONOMICS.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit the following report:

My duties began with the opening of the department of Economics on September 15th. Previous to this time no instruction had been given at this College in Agricultural Economics, and, with the exception of about twenty-five lectures on the principles of Political Economy given the second year, no Economics of any kind had been taught. Consequently *any* perceptible progress would be *great* progress, and it is only what might be expected if the work being done at the present time is largely of a missionary nature.

Since the opening of the fall term two periods per week have been taken with Second Year and one with Third Year.

In the course of the Second Year it is the aim to cover as fully as possible the outline given below, with a view towards giving the student such a grounding in the principles of Political Economy as will enable him in his Third Year to take up and discuss in an intelligent manner economic questions which have a direct bearing upon agriculture. The following is a synopsis of the work attempted:—

1. *General Notions.*
   The object of Political Economy.
   The wants of man.
   A discussion of wealth, value, price.

2. *Production.*
   Factors of production—the part played by nature, labor and capital.
   Methods of Production—Crises, overproduction, competition.
   Division of labor—conditions, advantages and disadvantages.

3. *Exchange.*
   Exchange value.
   The utility theory.
   The cost theory.
   Advantages of exchange.

4. *Principles of Money.*
   A short history of money.
   Fluctuations in money and disturbances caused thereby.
   The conditions which should be fulfilled by all good money.

5. *International Trade.*
   Advantages.
   Doctrine of Protection.
   Doctrine of Free Trade.
   Relative importance of Foreign and Domestic Commerce.

6. *Distribution.*
   How the Distribution of Wealth is effected.
   Wages, Trades Unions, Strikes, Interest, Laws of Interest, Rates of Interest, Profits.

7. *Saving.*
Conditions necessary.
Institutions to facilitate Saving.
The social utility of Saving.
Investment.

The course outlined for Third Year is as follows:

1. *Agricultural Education.*
Effect of Education on Agriculture.
Importance of so modifying and balancing Public and High School curri cula that the brightest boys may not be drawn from the farm.

2. *Features of the Agricultural Industry.*
Dependence upon nature.
Laws of Capital and Labor as applied to Agriculture.
Laws of Rent.
Relation to other industries—Agriculture a trade, a business, a profession.
Contrast between the management of Agriculture operations and those of the manufacturing industry.
Comparison of Canadian Agriculture with the Agriculture of United States and Great Britain.
Development of Commercial Agriculture.
Law of Diminishing Returns.
Effect of crop failures, immediate, prolonged, direct, and indirect.
The World's food supply.
Agricultural Resources of Canada.

3. *Markets.*
Local, Domestic, Foreign.
The Farmer and his competitors.
The Farmer and his creditors.
Banks and Middlemen.
Boards of Trade.
Prices and movements of prices of Agricultural products.
Transportation of Agricultural products—wagon, railroad, trolley line, canal, ocean.
Rates and discriminations.
Increase of consumption of products—the factors of choicer, more uni form, and better distribution of products.

4. *The Farmer and Co-operation.*
History, rules, essentials, dangers, gains, altruism, and organization of Co-operative Corporations.

5. *The Farmers Relation to the General Problems of the Day.*
The tariff, the single tax, food laws, government aid, farm labor, prob lem, use of machinery, Tenant Farming, Specialty *vs.* Diversified Farming.
Large *vs.* Small Farming.
Business methods.
Immigration and Migration.

It seems altogether unlikely that the course thus outlined for Third Year can be covered in one lecture per week; therefore I would strongly recommend continuing the work through Fourth Year.

Respectfully submitted,

H. H. LeDREW.

PART XVII.

THE DIRECTOR OF HOME ECONOMICS.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit herewith the fourth annual report of the work of the Home Economics department for 1907.

THE YEAR'S WORK.

As last year, the Home Economics department has been almost wholly occupied during this year with the instruction of students. The tradition of the College was maintained by eighty-eight per cent. of the students belonging to the non-professional class, who went back to their own homes to put into practice there, we hope, the lessons learned in Macdonald Institute. A strong class of Domestic Science teachers graduated from the normal course, and a good but small class from the housekeeper course. All of the housekeepers and the majority of the teachers are already at work in various situations between New Brunswick and Vancouver. A new course devoted chiefly to sewing and allied subjects was opened in September. The present class is small, but their work is proving attractive, and already several applications are filed for admission to the spring course. No great changes have been made in the other courses, but we believe those made have strengthened them.

THE DIFFERENT COURSES.

1. THE NORMAL COURSE.

Ten entered the two-year course in September, 1905. They formed an exceptionally strong and even class; all passed into the senior class in September, 1906; all passed the final examinations in June, 1907, and have received the Macdonald Institute Teacher's Certificate in Domestic Science. Nine entered the course in 1906; four passed on to the senior class in September, 1907, and are now in attendance. Fourteen students entered the course last September.

Eight experienced teachers entered the one-year course in September, 1906; all passed the final examinations in June, 1907, and have received the Macdonald Institute Teacher's Certificate in Domestic Science. Seven teachers entered this class last September. Last year we were obliged to refuse quite a number of applications; this year, when owing to the smaller number of two-year seniors, more could have been accepted, there were few applications. This is doubtless due to the general scarcity of teachers.

The Guelph public and high schools continue to send us classes for practice-teaching, but the number is cut down to four, because the class requiring practice is smaller than usual.

The courses as being carried out are fully outlined in the Calendar, and are about the same as last year, except that more time is given to biology and English has been made a required subject of the two-year course. The junior

class takes first year University English, and the senior class second year University English with Professor Reynolds. The students are thus able to write on university examinations in English. The subject was elective last year, but was made compulsory first for its value to the individual student, and second in order that graduates may take higher standing should they at some future time seek credit in other schools for the work done here.

An interesting part of the normal course is the experimental work carried out by senior students. It is planned in order that these students may have some training in such work in order that when faced with the housekeeper's frequent question, "Which is the best way?" they may be equal to the business of finding out if they do not know by accurate experience. Each student is given one problem to work upon; they are required to make careful plans, their work is supervised, and they must hand in a detailed report of the whole. Great care and accurate work is necessary to make these experiments of value to any but the student. Many of the reports make very interesting reading, and three such reports are given to show something of the nature of the work. They may be considered contributions to the solution of the problems stated.

I. Report of Experiment in Cooking Beans.

Lot.	Weight after Soaking.	Total Solids lost in Soaking.	Appearance of Cooked Beans.	Tenderness of Cooked Beans.	Palatability of Cooked Beans.	Weight of Cooked Beans.	Proteids lost in Cooking.
	Ozs.	Grams.				ozs.	grams.
I.....	12¼	1.924	Skin yellowish, rest of bean slightly yellow. Skin somewhat broken. Swollen about half as large again.	Skin leathery. Inside still quite firm.	Taste bitter and uncooked. Were not at all mealy.	15¾	3.85
II.....	12½	2.009	Skin slightly yellowish and more broken than in I. Size same as I.	Skin tough enough to be removed by rubbing. Inside quite hard.	Taste bitter and uncooked. Were no more mealy than in I.	16	3.815
III.	12¾	1.799	Skin slightly yellow, burst in many places and looked thinner. Inside looked mealy. Size same as I.	Skin more tender than I. and II. Inside very tender and mealy.	Flavor sweet and agreeable. Inside being mealy was easily broken up in mouth.	16½	3.64
IV.....	12¾	2.492	Beans white throughout, skins quite tender, transparent. Inside reduced almost to pulp.	Skin and inside both tender, but mushy rather than mealy.	Flavor flat, had no real flavor at all. Tasted mushy, all mealiness was destroyed.	17	5.439

A. *Problem.* To determine the most satisfactory method of boiling beans.

B. *Method.* Cook each lot for the same length of time.

(1) In water and lime, .03 per cent. lime.
(2) Guelph hard water.
(3) Guelph hard water softened by boiling.
(4) Guelph hard water softened by bicarbonate of soda; proportion 1 teasp. per gallon.

C. *General description of experiment.*

Four half-pound lots of small white beans were weighed out and placed each in a separate bowl.

Over 1 was poured 1 qt. of the lime water.
" 2 " " " Guelph hard water.
" 3 " " " " " " softened by boiling.
" 4 " " " " " " addition of ¼ teasp. of bicarbonate of soda.

Each was allowed to soak 12 hours. Then the water not soaked up by the beans was poured off, put into separate vessels and sent away for analysis by chemists. Then each lot was put into the upper part of double boilers, with cold water of the same kind and amount in which it had soaked. The upper parts of the double boilers were then placed into the lower parts, which were partially filled with boiling water. The four boilers were placed on lighted gas stoves. The beans were allowed to simmer thus for three hours. At the end of this time each lot of beans was drained from the water in which it had cooked. Each quantity of water was put into a separate bottle and was sent to the chemical laboratory for analysis.

N.B.—Throughout the experiment every care was taken to have all conditions equal.

Conclusions.

1. Beans soaked in softened water increase most in weight by taking up most water.

2. Three hours' cooking at simmering point will not soften and disintegrate the cellulose of beans soaked and cooked in hard water.

3. Beans cooked thus are neither palatable nor digestible.

4. The harder the water in which beans cooked, the same length of time, the more unpalatable and indigestible the beans, and the more proteid lost in cooking.

5. Beans cooked in water softened by boiling have a much more appetizing appearance than those cooked in water softened by baking soda. They keep their shape better and are only very slightly colored yellow.

6. Beans cooked in water softened by boiling are the most mealy. They would therefore be most digestible, as the saliva could most easily mix with the particles of the bean.

7. Beans cooked in water softened by boiling are the most palatable.

8. Beans cooked in water softened by boiling are the most nutritious. They lose least of their nutritive constituents in soaking and cooking.

9. As seen in this experiment, the best results are obtained by cooking beans in water softened by boiling.

N.B.—In all cases the skins were somewhat tough and therefore indigestible.

Statement of cost of experiment—2 lbs. white beans at 5 cents per pound, 10 cents.

Experiment carried out—May 26th and 27th, 1905, Macdonald Institute, Guelph, Ontario.

II. Report of Experiment in Vegetable Cooking.

A. *Problem.* To determine the most satisfactory way of cooking strong smelling vegetables.

1. Consider time required.
2. " smell through house.
3. " color of vegetable when served.
4. " flavor " " "
5. " tenderness " " "
6. " nutritious substance dissolved out.

B. *Vegetables cooked.* Onions, cabbage.

C. *Methods of Cooking.*

1. Boil hard in uncovered pot in salted water.
2. " " " " " unsalted water.
3. Simmer in close covered pot in salted water.
4. " " " " unsalted water.

D. *Order of procedure.* Considering all but point 2.

1. Plenty of boiling water was on hand.

2. One-half pound of onions were put into each of four stewpans. To the first and third one teaspoon of salt was added.

3. This was repeated with cabbage.

4. Stove plates were put on the gas burners for the third and fourth pan of each vegetable.

5. One pint of boiling water was added to each pan.

6. The third and fourth pan of each vegetable was covered, the gas lit and all cooked until done, the third and fourth of each being watched carefully and altogether one pint of boiling water added to 1 and 2 of each as it boiled down.

7. The time required for each was noted. When cooked they were drained through sieves into eight bowls, letting them stand until thoroughly drained.

8. While straining, the *color* of each, as in A. 3, was noted and compared.

9. Each was seasoned with salt to render it palatable, and the flavor compared as in A. 4.

10. Each was cut with a fork. tasted and compared for tenderness as in A. 5.

11. The liquid was bottled, labelled, and taken to the chemical laboratory for analysis, to compare the amount of nutritious substances dissolved out.

E. *Testing point 2 of onions.*

1. In each of two kitchens plenty of boiling water was on hand.

2. One-half pound of onions was put into each of two stewpans with one teaspoon of salt, according to conclusions of above experiments.

3. One pan was put on to cook in one room with one pint boiling water and boiled in uncovered pot until cooked.

4. The amount of smell through the house was noted.

5. The other pan was taken to another room, one pint boiling water added, and put on a gas burner over a stove plate, and simmered closely covered until done. The two pans were watched carefully to see that the odor of one did not reach the other, by keeping doors closed.

6. The smell of the latter was noted and compared with that by boiling.

F. *Result of Experiment on Onions.*

Method.	Time.	Smell through house.	Color when served.	Flavor.	Tenderness.	Nutritious substance dissolved out.
	mins.					grams.
1.	40	Odor in room next, and decided smell in the kitchen.	Yellowish white and watery.	Better flavor than in method 2. Not as good as in method 3.	No difference could be detected when each was cooked until done.	14.037
2.	40	"	"	Not as good as in methods 1, 3 or 4.	"	9.712
3.	80	A very slight odor in room next, and a slight odor in the kitchen.	Greenish white and nicer looking.	Better flavor than 1, 2 or 4.	"	13.695
4.	80	"	"	Better flavor than in method 2. Not as good as 1 or 3.	"	8.349

NOTE.—One teaspoonful of salt equals 5 grams. Just what proportion of this appeared in the liquid cannot be stated.

G. *Result of Experiment on Cabbage.*

Method.	Time.	Smell through house.	Color when served.	Flavor.	Tenderness.	Nutritious substance dissolved out.
	mins.					grams.
1.	50	Decided odor in the room and also just as you approach it.	Yellowish white and watery.	Better flavor than in method 2. Not as good as in method 3.	No difference could be detected when each was cooked until done.	10.148
2.	50	"	"	Not as good as in methods 1, 3 or 4.	"	6.9125
3.	60	Faint odor in the room none until you get right in.	Greenish white and nicer looking.	Better flavor than in 1, 2 or 4.	"	10.313
4.	60	"	"	Better flavor than in method 2. Not as good as in 1 or 2.	"	6.988

(f) Summary.

1. When simmering there is less steam escaping, and what little there is is not allowed to escape owing to the closely fitting cover. There is therefore much less odor escaping during the cooking.

2. The vegetables have a much better color simmered with a lid on.

3. The flavor is much better when the vegetable is cooked with salt. It is less insipid and more even than could be got by adding salt afterwards.

4. A longer time is taken to simmer.

5. More substance is dissolved out in using salt.

We do not depend on cabbage or onions to give us food substance, so the little lost is not of much importance.

The time taken to cook is usually a minor part, therefore points 4 and 5 are overbalanced by points 1, 2, and 3.

G. *Conclusion.*

The best method of cooking strong smelling vegetables is to simmer in a covered pot in salted water.

H. *Cost of the experiment.*

4 lbs. onions	20c.
4 lbs. cabbage	38c.
16 teaspoons salt	00.2c.
Total cost	58.2c.

III. Report of Experiment in Mixing Fat into Dough two Different Ways.

A. *Problem.* To determine the comparative result of adding shortening to a dough by rubbing or cutting it into the flour or by melting it and adding it.

1. In baking powder biscuits.
2. In cookie mixture (also by creaming shortening).

B. *Baking powder biscuit.*

1. *Ingredients.*

1 cup flour.
¼ teasp. salt.
1½ teasp. baking powder (Cleveland's).
1 tablesp. shortening (half butter and half lard).
⅓ cup sweet milk (about).

2. *Method.*

a. By rubbing shortening in. Sift dry ingredients together—flour, baking powder, and salt. Then shortening was added (rubbed int odry ingredients), then mixed as quickly as possible into a soft dough with milk.

b. By melting shortening. Dry ingredients were sifted together, using exactly the same proportions as in the first method, but instead of rubbing the shortening in, it was melted and mixed in flour, then the same amount of milk was added.

Both mixtures were handled as little as possible and baked in a hot oven 490° F. In both cases eight biscuits were made. The same conditions exactly were given in both cases, the only difference being the method in which shortening was added.

3. *Result.* Both were equally as well risen and from outward appearance looked equally as well, but on breaking the one with melted butter was of inferior texture and seemed very tough, while the one the butter was rubbed in, texture was much better, more spongy, and quite tender as compared to biscuits made by the other method (melted butter).

C. *Cookies.* Mixture made by adding shortening in three different ways:

a. By creaming butter.
b. By rubbing butter in flour.
c. By adding melted butter.

1. *Ingredients.*

1 cup flour.
⅓ cup butter.
½ cup sugar.
1 small egg.
⅔ teasp. cream tartar.
⅓ teasp. baking soda.
Two-ninths teasp. ginger.
⅙ of nutmeg.
1 teasp. hot water.

2. *Method.*

a. Butter was creamed and sugar added gradually, then egg added unbeaten and soda dissolved in hot water; lastly, flour, cream of tartar and spices sifted together. This mixture was allowed to stand 1 hr. in refrigerator.

b. Flour, cream of tartar and spices sifted together, then butter was rubbed in, then egg dropped in unbeaten, soda dissolved, and all mixed to a dough. This mixture was also allowed to stand for 1 hr. in refrigerator.

c. Flour, cream of tartar and spice was sifted together, then sugar added and then the melted butter, lastly the egg and dissolved soda.

Note.—Three teasp. of flour (extra) was added; part of this was used when rolling out the cookies.

The three mixtures had exactly the same conditions—were allowed to stand the same length of time, baked at same temperature. The only difference being the method the ingredients were combined. Rolled the same thickness and cut with the same cutter.

3. *Result.*

a. Made by creaming the butter had slightly better appearance, a little more crisp, and seemed to spread out a little in cooking.

b. and *c.* No noticeable difference in either appearance, crispness or flavor. Could not tell *b.* from *c.* if they had not been labelled. Both *b.* and *c.* seemed to rise more than *a.*, which flattened out a little.

The three mixtures were baked at a temperature of 320° F.

Note.—After the mixtures had stood for several hours the little difference that appeared at first seemed to disappear and it was impossible to tell one mixture from another when baked, one being equally as good as the other. *b.* and *c.* had a slightly spotted appearance owing to the sugar not being as well dissolved; this disappeared on standing.

2. The Housekeeper Course.

Five students entered this course in September, 1905; four passed to the senior class and two entered (by virtue of Normal and Homemaker course work) in September, 1906; four passed the final examinations in June, 1907, and have received the Macdonald Institute Housekeeper certificate. These four, after graduation in June, remained in Macdonald Hall all through July, in order to get extra experience by acting as assistants to Miss Tennant

while the Summer School was in session. The experience proved so valuable that we hope it may become a permanent feature of the course. Four entered the course in September, 1906; three passed into the senior class last September, and four are now in attendance. Three entered upon the course last September.

Three graduates are entitled to receive the Professional Housekeeper certificate because of having successfully completed six months' work as an institution housekeeper.

This course is a professional one offered to mature women who have had a good deal of housekeeping experience at home and desire training to fit themselves for housekeepers or dietitians in larger institutions. They are expected to have good executive ability before entering and the course aims to give them correct standards in the preparation of food, housework, sanitation, etc., and to train their executive ability along the lines of institution requirements. They are required to take the same science and practical work as the Normal students, but instead of studying school equipments and methods of teaching, they study methods of administration for large buildings such as our own residences for men and women. Each is in turn required to act as marketwoman, loan clerk, and classroom housekeeper, doing the clerical work of each office. With Miss Tennant's assistance and instruction they investigate the working of Macdonald Hall. Part of this investigation consists of becoming a dining-room maid, a house-maid, and a kitchen-maid for a short time in order to gain accurate and intimate knowledge of the duties and difficulties of each position.

The opening of this course has been fully justified by the results. All the graduates have readily found employment, and several have been at work long enough to demonstrate their success. We could have placed half a dozen more in the last two months. The demand for them is increasing rapidly, but we have no hope of meeting the demand, as our present class is small. This is a pity, because the salaries offered are as good, and in many cases better than those of the average domestic science teacher. There are many capable women in the Province to whom this work should be attractive when they realize its possibilities. Two years of time, and three hundred and sixty dollars in money, seems a good deal to spend after a woman has reached mature years, but a comfortable income and a good home is worth the time and the money.

3. The Homemaker Course.

This is the non-professional course planned for the girls who have had little experience of household affairs. The required work is about the same as last year's, with the addition of an interesting course in color-harmony with Mr. Evans. This has not been fully worked out, but the results justify its beginning and demand its extension. It is an effort to lead the girls to apply the laws of color and form to clothing and home decoration. It began with a study of the primary, secondary, and tertiary colors with a water color box as a basis, for standards in their combination later. Thence they passed to a brief study of color-balance, which is the proper proportion of different colors in one combination. They took up a little elementary work in design, and immediately worked out simple designs suitable for cushions, curtains, etc. Some of these were carried out in cloth and color. Following this they carried out practical demonstrations of color combinations in dress, using actual cloth, hats, etc., and finally carried out some practice in combining wall papers, furniture, etc. A small room was given over to their use and

the girls worked in sections. Each group worked out a different color combination and decorated one corner, which was criticised and discussed before the next group had its turn. We have been trying to develop work along this line since the Institute's opening year, but this attempt is the first that has proved at all satisfactory. This kind of work, like other practical work, takes a great deal of time, but we believe it to be of great value to the girls.

Every student is required to take the prescribed subjects. If she gives evidence that she has accomplished the work of any subject elsewhere, she is given credit for it and permitted to elect other subjects to occupy the time. This proves of great advantage to the girl who has been taught elementary sewing at home, since she is then able to begin in a higher class and accomplish a good deal of advanced sewing in the year. The practical housework and practice-housekeeping are very satisfactory features of this course, giving most valuable training to the inexperienced girl who works earnestly.

Twenty-three entered this class in September, 1906, ten passed the final examinations last June, and have received the Macdonald Institute Homemaker diploma. Twenty-eight entered last September and are now in attendance.

There is no dearth of applicants for admission to this course. It is one of the most popular with parents, but it will be noticed that the number who complete the course is small. This is probably due in part to the lack of incentive in a non-professional diploma, in part to the fact that the course is comparatively new and our girls have not yet learned to look upon the possession of the Homemaker diploma with the same sort of pride the College graduate looks upon her degree; and in part to the fact that many girls do not realize before entrance that the course calls for a great deal of hard, earnest mental work as well as plenty of practical work.

It is gratifying to note that three members of the present class propose continuing two years. They are taking practical and science work with the professional classes, and will take additional English and electives to broaden their course. This may prove the beginning of a course which may develop into an O.A.C. associate course.

4. The Short Course in Domestic Science.

This course, which consists of a good deal of practical work in cookery, laundry and sewing, a few lectures each on home nursing, food and sanitation, an elective subject and a little practical housework, is as popular as ever. There are no examinations and no diploma for incentive, but we find the average student works hard to get as much as possible into the three months' time. The course as outlined last year proved so satisfactory that no change was made in it this year.

There were in attendance this year:

Winter term, January to March	40
Spring term, April to June	26
Autumn term, September to December	29
Total	95

5. The Short Course in Sewing.

This is the new course offered to meet the demand for a three months' course devoted to sewing and allied subjects, in much the same way as the other short course is devoted to domestic science. It was opened in Septem-

ber with four old and one new students. The class is small, but their work is attracting a good deal of attention. Eight applications for the Spring course have been accepted already and we are likely to have a full class when it opens. The course is in no sense professional. Its object is to do all that can be done in three months to help the girl who is anxious to learn to do the simple dressmaking required in the average home.

Each candidate for entrance must be possessed of good eyesight and give satisfactory evidence of her ability to make a plain cotton shirtwaist. There is no examination and no certificate for this course. There are four lessons weekly in dressmaking, two in millinery, two in embroidery, two in color work like that of the Homemaker course, one in laundry, one in the study of textiles and one elective. The practical lessons demand a good deal of work outside of classes and keep the girls pretty busy, but they are accomplishing a good deal.

6. Optional Courses.

These courses are made up of subjects chosen from the regular courses and list of optional subjects.

The number of optional students this year was small because most of the classes were filled with students of regular courses, and the teachers' time so fully occupied with them that it was not possible to open more than one extra class. The majority were Guelph girls taking one or two subjects.

During the year there have been five six-month students, thirteen three-month students and eleven who came for a course of twelve cookery lessons. The last eleven were office girls from Guelph, who formed the evening class.

Student Workers.

The arrangement continues with the housekeeper of Macdonald Hall by which a few girls are enable to defray the cost of a short course in Domestic Science with their own work instead of with cash. The student worker gives four months' service as dining-room girl, and in return takes the Short Course in Domestic Science. While giving her services she wears the regular student working dress, is lodged among the students and is considered as a student. The housekeeper's tact and her exceptionally fine group of employees, make the arrangement very satisfactory to the student-workers, and it is hoped this feature will become a permanent one.

A special arrangement permits a student-worker to pay $15 in cash and three months' service instead of the regular four months.

Three student-workers entered in January, two of whom dropped out almost at the beginning. Three entered in September, and three are ready to take their places in January.

Special Lectures, Meetings, Etc.

The special marketing lectures were again carried out by College professors. All were illustrated except Professor Harcourt's, who made his especially interesting with an account of some of his recent breakfast-food investigations.

They were as follows:—Vegetables, Mr. Peart; Canned Food, Professor Edwards; Fruit, Professor Hutt; Cereals, Professor Harcourt; Meat, Professor G. E. Day.

The senior chemistry class paid its customary visit to the beet sugar and other Berlin factories.

The cooking exhibit of the Fergus Fair was this year judged by Miss McPhee.

This department was represented at the Ontario Educational Association by Miss Givin and myself in the capacity of president of the Home Science Section. The work of inviting all domestic science teachers to send in questions for discussion at a round table conference, of distributing the questions for answer, and of collecting and arranging both, was undertaken by this department. The time allowed by the conference was so short, and the questions and answers so interesting and valuable to the domestic science teachers, that this department duplicated and distributed them. So many of the domestic science teachers are Macdonald Institute graduates, the labor seemed to be worth while.

I attended the meeting of the National Council of Women in Vancouver, B.C., July 15-20, as the representative of Mrs. Hoodless, vice-president for Ontario and convenor of the Domestic Science Committee. My work outside of listening attentively to the various discussions, reading the domestic science reports entrusted to me, and casting my votes in support of domestic science interests, consisted chiefly in answering questions about Macdonald Institute. Everywhere great interest was evinced in its work and possibilities. The trip out was very pleasant, as the Eastern contingent of the Council journeyed together, and made stops at Fort William, Winnipeg, Brandon, Regina, Calgary and Revelstoke, for sight-seeing, entertainments by local councils, meetings, etc. Their schedule was arranged so that the ride through the mountains and the wonderful run down the canyons from Revelstoke to Vancouver, were taken by day.

The executive committee of the National Council asked to hold their next meeting in Macdonald Institute this month at the time of the Women's Institute convention, in order to see the College and hear at first hand something of the work of the Women's Institute, one of its largest federated societies. They have received your cordial invitation to do so, and arranged their meeting for December 10-11.

Recipients of the Teachers' Certificate in Domestic Science.

A. *Graduates of the Two-year Normal Class.*

Miss Mary Evelyn Allan, Guelph.
" Jean Armstrong, Owen Sound.
" Nellie G. Carlyle, Brantford.
" Clara E. Elliot, Hamilton.
" Edith M. McKenzie, Toronto.
" Kate MacLennan, Owen Sound.
Miss Mary E. McLennan, Dartmouth, N.S.
" Ida A. Northrup, Kingston, N.B.
" Eva L. Pickett, Vittoria.
" Jessie D. Ross, Oakville.

B. *Graduates of the One-year Normal Class*

Miss Edna M. Burns, Que.
" Grace E. Dutcher, Charlottetown, P.E.I.
Mrs. A. E. Fairlie, Port Credit.
Miss Mary C. McManus, Montreal, Que.
Mrs. W. H. Muldrew, Madoc.
Miss Ethel Steinhoff, Stratford.
" Fannie A. Twiss, Hamilton.
" Edith M. Wright, Perth.

C. *Graduate of Normal Domestic Science* after credit for work in Truro School of Domestic Science and optional courses covering two years.

Miss Emma H. Bigelow .....Truro, Nova Scotia.

Recipients of the Housekeeper Certificate.

Miss Sarah Evelyn Bray, Paris.
" Mabel Mortimer, Honeywood.
Miss Robena Murdoch, Guelph.
" Alice M. Purdy, Shefford Vale, P.Q.

RECIPIENTS OF THE PROFESSIONAL HOUSEKEEPER CERTIFICATE.

Miss Ethel Tennant, Toronto.
" Jean G. Allan, Hamilton.
Miss Erie Shand, Port Dover.

RECIPIENTS OF THE HOMEMAKER DIPLOMA.

Miss Ethelreda Briggs, St. Catharines.
" Cecilia S. Bell, London.
" Hilda Cayley, Toronto.
" Grace K. Hayward, St. John, N.B.
" Bessie Knight, St. John, N.B.
Miss Nellie Malcolm, Kinlough.
" Barbara Palmer, Woodstock.
" Eunice Pardoe, Toronto
" Mary Turriff, Ottawa.
" Carrie Zavitz, Forks Road.

SUMMARY OF ATTENDANCE.

A. January to June, completing the College year of 1906-1907.	
Normal Students	27
Senior, Sept., 1905, 10; senior, Sept., 1906, 8; junior, Sept., 1906, 9.	
Housekeeper Students	9
Senior, 5; juniors, 4.	
Homemaker Students	19
Short Course in Domestic Science	66
Winter term, 40; spring term, 26.	
Optional Course Students	26
Six months, 5; three months, 10; special evening class (12 lessons in cookery) 11.	
Public and High School classes	73
B. Summer Course in Domestic Science	11
C. September to December, opening the College year of 1907-1908.	
Normal Students	25
Seniors, September, 1906, 4; seniors, September, 1907, 7; juniors, September, 1907, 14.	
Housekeeper Students	7
Seniors, 4; juniors, 3.	
Homemaker Students	28
Two-year course, 3; one-year course, 25.	
Short Course in Domestic Science	29
Short Course in Sewing	5
Optional Course Students	3
Public and High School Class Students	52
	379
D. Students counted in both of above lists:	
In two-year courses	8
1906-1907 students returned for 1907-1908 work	3
Public School class student	1
	12
E. Total number of students in 1907	367
F. Increase in attendance over 1906	24

Staff Changes.

Miss Bigelow resigned the laundry and household administration work last July. Miss Evelyn Allan, holding the Ontario first-class professional certificate and the Macdonald Institute teachers certificate in domestic science, was chosen to replace her. She has been in charge since September and is doing excellent work.

An additional teacher became necessary when it was decided to open the new short course in sewing. As usual, there was difficulty in finding a satisfactory one, because Ontario schools are not training sewing teachers, and first-class experienced graduates of the United States schools are too well paid in their own country to find our assistant's salary attractive. Miss Ethel Fonda, a graduate of Pratt Institute, New York, was finally chosen. She joined the staff in September, and is doing good work.

Positions Occupied by the 1907 Graduates.

Miss *Burns*, domestic science teacher in Renfrew.
Miss *Dutcher*, housekeeper and domestic science teacher in a Settlement House.
Miss *McManus*, domestic science teacher in Renfrew. (Since resigned.)
Mrs. *Muldrew*, house mother of girls' dormitory in Macdonald College, Que.
Miss *Steinhoff*, domestic science teacher in Ingersoll.
Miss *Twiss*, domestic science teacher in Galt.
Miss *Allan*, laundry and household administration demonstrator in Macdonald Institute.
Miss *Elliott*, employed in flour testing department of the Ogilvie Milling Company.
Miss *McKenzie*, domestic science teacher in Halifax Ladies College.
Miss *K. MacLennan*, domestic science teacher in Montreal Y.W.C.A.
Miss *Northrup*, engaged for domestic science teaching in St. John, N.B., in January.
Miss *Bray*, dietetic work in the Eastern Hospital, Brockville.
Miss *Mortimer*, housekeeper in General Hospital, Vancouver, B.C.
Miss *Murdoch*, housekeeper in Presbyterian Hospital, Alleghany, Pa.
Miss *Purdy*, demonstrator in the Chemical Department, O.A.C.
Miss *Bigelow*, laundry teacher in Macdonald College, Que.

Miss Warner dropped her housekeeper course within three months of completion, to take the bread experimentalist position with the Ogilvie Milling Company, when Miss McPhee came to the O.A.C.

After a year's work in Columbia University, New York, two 1906 graduates, Miss DeLury and Miss McCaig, have also joined the staff of Macdonald College, Que.

Equipment, Etc.

An effort has been made to carry out the plan of setting up an inexpensive class-kitchen equipment to illustrate what can be done in rural schools, or other places where gas stoves, plumbing, and separate rooms are out of the question. An equipment of trestle tables, cupboards and utensils has been purchased and installed in one of the rooms left vacant by the Manual Training department. It is suitable for individual work with a class of twelve and is now being tested by use with a public school class.

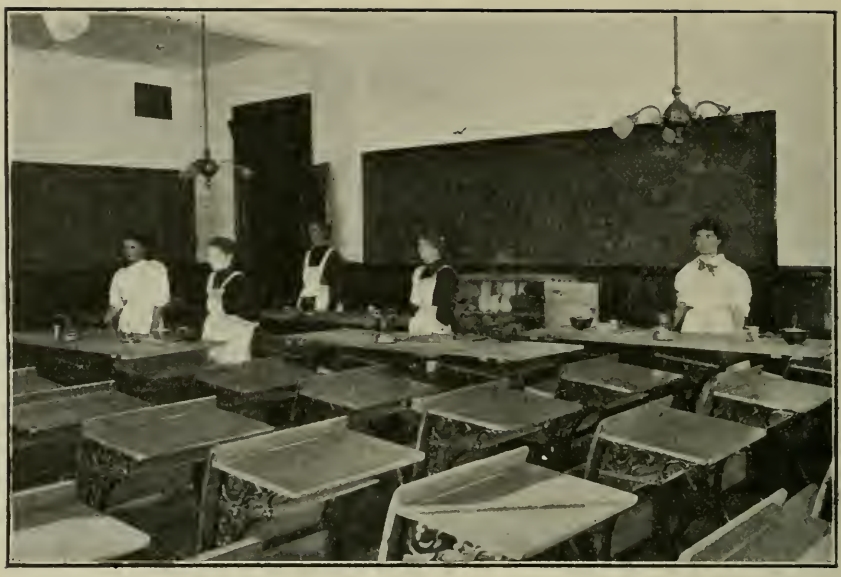


Table tops set on desks of ordinary school room.

Room equipped for a table setting lesson.

Following is a list of the equipment showing the exact cost of each item:

Article.	Cost.
12 Bowls, brown	85
12 Bread tins	95
12 Teacups & saucers	1 25
12 Tin measuring cups	1 25
12 Egg beaters	30
12 Forks	50
12 Case knives	1 25
12 Paring knives	1 25
12 Plates	85
12 Saucepans	1 68
12 Tablespoons	50
24 Teaspoons	40
12 Wooden Spoons	60
12 Stewpans	2 40
12 Strainers	65
2 Trays	80
1 Bowl, yellow	25
1 Bowl, do	35
1 Bowl, do	45
3 Scissors	1 50
5 Trestle Tables	20 55
6 Frying pans	90
3 Tea strainers	15
3 Match box stands	24
1 Emery knife	20
3 Soap dishes	25
12 Pepper shakers	1 50
12 Salt shakers	1 50
1 Bell	50
4 Lemon Reamers	40
6 Stoves, kerosene	6 00
12 Plates, dinner	1 25
6 Plates, soup	60
4 Jugs	60
1 Jug	45

Article.	Cost.
1 Butcher knife	30
1 French knife	60
2 Spatulas	80
6 Teaspoons	10
3 Tablespoons	13
4 Brushes	20
2 Stove mitts	50
4 Asbestos mats	20
1 Corkscrew	25
4 Egg beaters	60
4 Wash basins	92
3 Draining pans	69
4 Dishpans	2 00
6 Broilers	48
3 Cake tins	35
4 Graters	40
3 Strainers	75
24 Pattie pans	20
2 Tin dippers	40
2 Fibre pails	70
1 Colander	35
1 Pail, enamel	70
1 Pan, enamel	18
3 Tea kettles	2 70
1 Saucepan	30
1 Saucepan	25
1 Saucepan	23
1 Saucepan	30
1 Double boiler	85
1 Kettle, covered	60
*1 Stove (to burn coal or wood).	30 00
Total	$100 05

*The above may be replaced by a twenty-dollar wood stove or a ten-dollar two burner coal oil stove.

The whole equipment is attractive, and is capable of modifications which will adapt it to the conditions of many schools. The Ontario Educational Department offers generous assistance to the schools which teach domestic science, and it is hoped this equipment will encourage the spread of domestic science teaching from the cities and towns to the village and rural schools.

The sewing department has been aided by the addition of several really good fashion magazines and some illustrative material. If we are to work out a course in color-harmony as applied to dress and home furnishing, we shall need considerable additions to the latter.

The physiology work has been greatly benefited by the skeletons and models added to the physiological collection.

The laundry class-room arrangements for washing and drying clothes have been satisfactory from the first, but those for ironing and heating irons proved inadequate. The common kitchen tables were not large enough for two students, and so much room was occupied by chairs and stove that more tables were out of the question. Half the class was obliged to walk the length of the large room for each hot iron, and the heat of the room proved very trying in warm weather. These difficulties have been done away with by transferring the wood stove to the new rural school equipment, running a gas pipe along the back of the tubs which stand around three sides of a

Room equipment for cooking lesson.

Showing equipment stowed away compactly as possible.

square in the middle of the room, and attaching six small gas flat-iron heaters with swing joints so that they can be swung forward on a board across the tubs when in use, and swung back out of the way when the tubs are in use. The old tables and chairs have been replaced by new tables. The top of the table swings back to form the back of a four foot bench, the seat of which is the cover of a box that holds all the laundry equipment of basins, spoons, knife, ironing blanket, sheet, choths, etc., needed by one student. While writing notes two girls use one table as a bench and the other to write upon. This gives each student an ironing table with hot irons within easy reach. The whole arrangement is very compact, and a substantial desk with a paraffined top completes a room for which we shall no longer have to apologize.

The attendance next term promises to exceed that of this year's winter term. If all of the present long course students return after Christmas and all of the accepted short course students claim their places, optional students will have to board outside, as Macdonald Hall will be filled with regular students.

I beg to acknowledge the efficient work of the other members of the Home Economics staff, and the valuable help given to this department by many of the other departments.

Respectfully submitted,

MARY URIE WATSON.

PART XVIII.

THE PROFESSOR OF MANUAL TRAINING.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit for your consideration my fourth annual report on the work of the Manual Training and Farm Mechanics Department for the year 1907.

We vacated our rooms at the Macdonald Institute for the more commodious new building designated "Machinery Hall," with its perfectly lighted and larger rooms, additional machinery, tools and implements, early in April. A fairly good description of this building was given in my last report. There is, therefore, no need of entering into detailed account of the structural features, conveniences and accommodation afforded by the "Hall" for carrying on the various branches of work of this department.

Machinery Hall, Macdonald Institute, Guelph.

We trust that our new quarters, with better and more efficient means of instruction, will be productive of intellectual and ethical development in our students, for what is now needed are men who know the fundamental laws of nature and how to apply them, and, above all, men who understand the nature and handling of machinery. The opportunities offered in these rooms to learn the great truths of Nature, and how her immutable laws are applied in various ways for the welfare or comfort of mankind, should help to awaken in the student the realization that the prosperity of our agricultural community depends, not so much on the produce of her soil, as upon improved implements and machinery for the better cultivation of the land and greater success in more expeditious handling and harvesting of the crops. From the reaping hook and cradle to the modern self-binder

is a far cry. Machinery to-day is doing the worlds' work, and that granted, it follows that our graduates taught how to handle machinery are equipped for the world's work, and for the gaining of an honorable livelihood. The management of complicated machinery, like that of a self-binder, demands brain power rather than mere muscle to be able to work a machine in accordance with its greatest efficiency. The time spent by our students at the forge, benchwork, and farm mechanics affords a sound basis for correlation of studies, but the time devoted to this work should be extended: the maximum number of hours given to each subject is but six hours during the whole term. More important still, in my opinion, is the initiation of all into some of the fundamental and typical processes in farm operations in which implements and machinery are able to assist and benefit mankind.

Speaking before the Iowa Implement Dealers' Association, Mr. Henry Wallace is reported to have said:

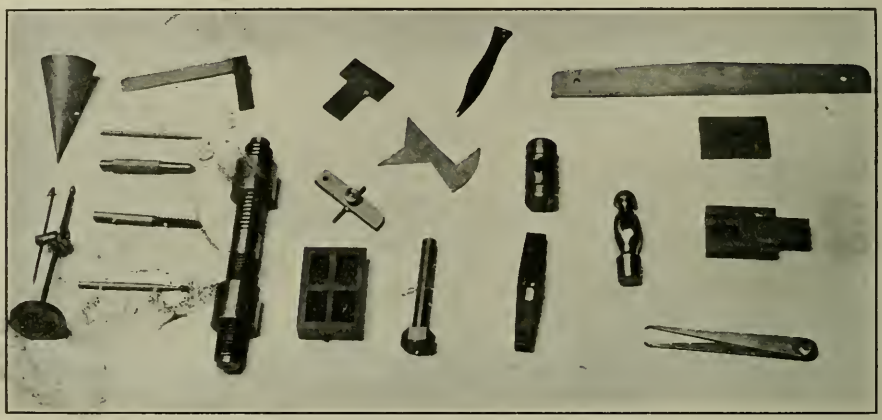
"As farm labor becomes skilled labor, the farmer cannot use the ordinary labor of the city, of the factory, or of the railroad. Farming has become a profession, requiring the highest intelligence and the highest skill, and this always requires a higher relative wage, when board and lodging are considered, than can be given to labor in the city or town. This high-priced labor requires him to use animal help instead of human muscle; and brings me to the second reason, namely, the need of more expensive machinery.

"The farmer can no longer do with the eight-foot harrow run by two horses. It must be a sixteen, twenty-four, or thirty-two foot, drawn by four horses. He must, if he is to meet the demands of the coming millions, bring his soil into better physical condition. This requires a different class of implements, a heavier plow, the disk and the disk roller, the spading harrow; for it is not three or four inches of soil that he is now cultivating, but six, eight or ten. He begins to realize that if he is to use the carbon and the nitrogen of the air as well as the fertility of his soil, he must put it in better physical condition and do more thorough tillage, and this means that he must have improved machinery, which, again, requires higher intelligence for its use and higher-priced labor."

With the increased space and better facilities, the scope of the work rapidly widened, rendering arrangement of the classes between two men somewhat difficult. Indeed, we were constrained to seek temporary help for the Summer School, and again for the present fall term. For the Summer School we secured the services of Miss Powell of London, Ont., who took the Constructive and Art work. This arrangement relieved Mr. Kendall and myself to apply our energies to the Forging, Benchwork, and Machine shop practice. In the fall term when the Second Year men came up for Forging, Benchwork, and Farm Mechanics, the same difficulty was experienced. The class aggregated sixty-two in number, divided into two divisions. Each division had to be arranged into three sections, Forging, Benchwork, and Gasoline Engines and Farm Mechanics, so that it was inevitable we should get more teaching assistance. In the person of Mr. R. W. Wade, B.S.A., of the Animal Husbandry Department, we found an agreeable colleague and an able instructor, with considerable practical experience in handling farm implements, and a sound knowledge of the mechanism of farm machinery. He was good enough to give us of his time two afternoons a week. I feel it justly due to Mr. Wade to express our grateful appreciation of his having so willingly assumed and so faithfully performed the task allotted him. It also gives me great pleasure to acknowledge and record the valuable assistance rendered by Miss Powell and her kindly cooperation in the work of the Summer School; and to testify to the uniform work performed by Mr. Kendall throughout the year.

Attendance: Winter term 1907; First year, 79; Second year, 66.
Fall term, Second year, 62.

The instruction in Farm Mechanics has been supplemented by visits to several factories in the City of Guelph, manufacturing agricultural implements and gasoline engines. Two afternoons were spent by the Second Year men during the fall term in the showrooms and workshops of the Louden Machinery Co., Tolton Bros., and the Gilson Manufacturing Co., investigating the construction and latest improvements in the goods turned out by these firms. Considerable amount of time had been given to prepare the showrooms for the practical demonstrations, by having a variety of implements and machinery arranged and fixed up to illustrate the merits of the inventions. Thorough explanations of the working parts were given by the managers of the respective firms. We tender these gentlemen and their firms our sincere thanks for the privilege of spending so much time in their workshops gathering most useful and profitable information regarding farm implements, machinery, and gasoline engines.



Course in Machine Shop Practice; Bench and Vice Work.

It is with great pleasure I have to announce that the Loudon Machinery Co. has offered a prize of $20, confined to the present Second Year students, for the best plan of a barn to accommodate twenty head of cattle, five horses, and all the necessary adjuncts which such a building should contain in the way of root cellar, loose boxes, pens, etc. They are also prepared to fix up in the "Hall" any piece of machinery, in their line, we may choose to select.

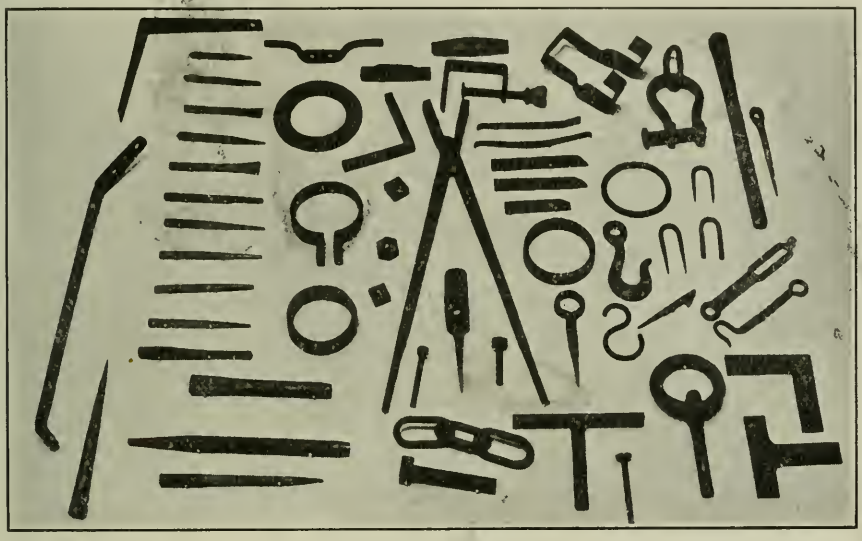
We are indebted, too, to the Gilson Manufacturing Co. for donating a two and a half horse power gasoline engine, and to Mr. Brown of the Aspinwall Manufacturing Co., Jackson, Mich., for the gift of a potato planter, sprayer, cutter and sorter.

In this connection I would like to mention that we require for demonstration work with power, all kinds of light machinery, such as grinders, pulpers, sprayers, cream separators, and such parts of field machinery as the "Knotter" of the self-binder, the cutting and gearing mechanism of the mower, so that the students may become familiar with the parts before attempting the entire machine.

Power on the Farm.

The problem of power on the farm is becoming an important question in view of the economic state of the labor market. The farmer, realizing these conditions, is turning his attention to studying the possibilities of the ap-

plication of motive power to perform many operations now done by hand labor. There are two classes of power necessary for agricultural work—the tractive force and the belt power. So far as the tractive force is concerned the demand seems to be for a light engine of from twenty to fifty horse power, that can be hitched on to any existing machine or implement on the farm and form, as it were, a part and parcel of the whole, without any additional "dead" wheels.



Course in Forging.

One of the Optional Courses—Art Metalwork—Combination of Wood and Metal.

"Considerable development has been made within the year in motive power for the farm, as the following account of Motor Harvesting feats will show:

"An interesting demonstration of the possibilities of motor harvesting was given at Kirton in Lincolnshire, recently, when growing grain was made into bread in four

hours, loaves being handed round which has been produced from the grain standing in the field that period of time previously. The trials took place on a farm belonging to Messrs. Dennis Brothers, and they constituted an excellent example of up-to-date rapid harvesting.

"An acre of standing grain was marked out in a field. At 11.35 a.m. a 50-horse power agricultural tractor by Messrs. H. P. Saunderson & Co., Ltd., of Elstow Works, Bedford, drew a thrashing machine into the field and a few minutes later the tractor was coupled to two Massey Harris binders. Half a dozen men walked behind and stooked the sheaves as they fell, and in about a quarter of an hour, the acre was cut and stooked. The tractor was then connected to a cart, which was loaded in the usual way, and the wheat was carried to the thrashing machine in another part of the field, and there it was thrashed, the motor driving the thrasher. By one o'clock the thrashing was ready to begin. At ten minutes past one, a halt was called for luncheon. As soon as the thrashing had begun, the flour was seen to come out of a grain grinding mill, which was worked by a belt from a pulley on the thrashing machine. The tractor then took a 3-furrow plow to another field, and at 3 o'clock plowing began, the furrows being 10 inches in width and 7 inches deep. An acre of land was finished at 4.45 p.m., this time including half an hour's halt for an over heated bearing. A cultivator and seed drill were then hooked on behind, and at 5.30 p.m. the acre was ready for the harrow, which finished its work at 6.45 p.m. After deducting the luncheon interval and the stop due to the bearing, the net time occupied was 6 hours 40 minutes, for cutting, binding, thrashing, and grinding one acre of grain; and ploughing, drilling, harrowing one acre of land ready for a new crop.

This is certainly good work, and shows how much can be accomplished by motor-driven implements. Demonstrations of this character should do much to popularize the use of agricultural motors. We have ever held that light agricultural motors will one day be as freely used and as popular indeed as are mowing and reaping machines, and the proofs that continue to come forward regarding their economy and general usefulness certainly strengthen this belief. A propos of up-to-date farming, Mr. A. Burness Creig of Winnipeg is, we notice, just now advocating the use of a strong steam driven cultivator every third or fourth year, going to a depth of 12 or 14 inches, and using narrow chisel points, so as not to bring the subsoil to the surface."

As to the belt power, it is now conceded that much useful work can be accomplished by engines burning gasoline, kerosene, or alcohol as fuel. These engines are easy to understand and require but little attention while running. For pumping, churning, and for running small machines, such as cream separators, small pulpers and straw cutters, a power ranging from two to five horse power will do very effective work, but for larger grinders and feed cutters, it will require an engine of from eight to twelve horse power.

The United States Government experts who have been investigating the use of alcohol in internal combustion engines have prepared a bulletin covering it at some length. Their findings are summarized in the following conclusions:

1. Any engine on the American market to-day, operating with gasoline or kerosene, can operate with alcohol fuel without any structural change whatever with proper manipulation.

2. Alcohol contains approximately 0.6 of the heating value of gasoline, by weight, and in the department's experiments a small engine required 1.8 times as much alcohol as gasoline per horse power per hour. This corresponds very closely with the relative heating value of the fuels, indicating practically the same thermal efficiency with the two when vaporizing is complete.

3. In some cases carbureters designed for gasoline do not vaporize all the alcohol supplied, and in such cases the excess of alcohol consumed is greater than indicated above.

4. The absolute excess of alcohol consumed over gasoline or kerosene will be reduced by such changes as will increase the thermal efficiency of the engine.

5. The thermal efficiency of these engines can be improved when they are to be operated by alcohol, first by altering the construction of the carbureter to accomplish complete vaporization, and second, by increasing the compression very materially.

6. An engine designed for gasoline or kerosene can, without any material alterations to adapt it to alcohol, give slightly more power (about 10 per cent.) than when operated with gasoline or kerosene, but this increase is at the expense of greater consumption of fuel. By alterations designed to adapt the engine to new fuel this excess of power may be increased about 20 per cent.

7. Because of the increased output without corresponding increase in size, alcohol engines should sell for less per horse-power than gasoline or kerosene engines of the same class.

8. The different design of gasoline or kerosene engines are not equally well adapted to the burning of alcohol, though all may burn it with a fair degree of success.

9. Storage of alcohol and its use in engines is much less dangerous than that of gasoline, as well as being decidedly more pleasant.

10. The exhaust from an alcohol engine is less likely to be offensive than the exhaust from a gasoline or kerosene engine, although there will be some odor, due to lubricating oil and imperfect combustion in the engine if not skilfully operated.

11. It requires no more skill to operate an alcohol engine than one intended for gasoline or kerosene.

12. There is no reason to suppose that the cost of repairs and lubrication will be any greater for an alcohol engine than for one built for gasoline or kerosene.

13. There seems to be no tendency for the interior of an alcohol engine to become sooty, as in the case with gasoline and kerosene.

14. With proper manipulation there seems to be no undue corrosion of the interior due to the use of alcohol.

15. The fact that the exhaust from the alcohol engine is not as hot as that from gasoline and kerosene engines seems to indicate that there will be less danger from fire, less offence in a room traversed by the exhaust pipe, and less possibility of burning the lubricating oil. This latter point is also borne out by the fact that the exhaust shows less smokiness.

16. In localities where there is a supply of cheap raw material for the manufacture of denatured alcohol, and which at the same time remote from the source of supply of gasoline, alcohol may immediately compete with gasoline as a fuel for engines.

17. If, as time goes on, kerosene and its distillates become scarcer and dearer, by reason of exhaustion of natural deposits, the alcohol engine will become a stronger and stronger competitor, with a possibility that in time it may entirely supplant the kerosene and gasoline engines.

18. By reasons of its greater safety and its adaptability to the work, alcohol should immediately supplant gasoline for use in boats.

19. By reason of cleanliness in handling the fuel, increased safety in fuel storage, and less offensiveness in the exhaust, alcohol engines will, in part, displace gasoline engines for automobile work, but only when cost of fuel for operation is a subordinate consideration. In this field it is impossible to conveniently increase the compression because of starting difficulties, so that the efficiency can not be improved as conveniently as in other types of engines.

20. In most localities it is not likely that alcohol power will be cheaper or as cheap as gasoline power for some time to come.

A New Binder.

It is highly important in this machinery age that farmers are kept in touch with all that is going on.

"A radical modification in binder construction is in the field evolved by Mr. Samuel Millar, a practical farmer of Otago, New Zealand. It is said Mr. Millar has spent four years in working out this new type of harvester. The main advantages claimed for it are that there are no canvases (in itself a great saving); there is not a cog on the machine. The crop is cut, conveyed to the binder, and tied and discharged all on the vertical. The machine has neither spur wheel nor chain, and is simplicity itself. The driver works the entire contrivance without having to move from his seat. It has been found to act to perfection in short crops, and especially in rye grass, and it is claimed that it will cut and tie anything form six inches in height upwards. The ordinary harvester weighs from 16 cwt. to a ton, but Mr. Millar's patent weighs only 9 cwt. and will probably be made considerably lighter. It is stated that two horses are able to draw it without strain for eight hours, which, as every practical farmer knows, is a vast improvement on existing conditions. The yolk—itself a valuable invention—is on the pulley system, and is so arranged that each horse is made to do its fair share of pulling. The main drive wheel is 4 feet 6 inches, but can be geared up to any requirement, and the raising or lowering of the cutters is regulated by means of lever, manipulated like everything else, by the driver from his seat. The knotter is another remarkable patent connected with this machine. It is much simplified, and has no bevel wheels to get out of gear. This harvester-binder has come through many preliminary trials most successfully, and is to be put through sundry other exhaustive tests during the next harvest."

Normal Course in Manual Training.

The purpose of this course is to give the professional trained teacher desiring to become an instructor of Manual Training an adequate and efficient training in the theory and practice of the subject. The course extends over twelve months and embraces a wide range of practical and theoretical work.

The full course was taken by Mr. John Burchill, M.A., Cobourg; Mr. A. N. Scarrow, Bradford; and Mrs. J. E. Lyon, Guelph. These three students passed successfully the prescribed examinations and have been awarded the College Diploma. Messrs. Burchill and Scarrow also received the Education Department's Certificate as "Specialists" in Manual Training. Both have resumed their former positions which they held prior to coming to Guelph. Mr. Scarrow, however, will take up, in January, 1908, the Instructorship of Manual Training at the Owen Sound Collegiate Institute, *vice* Mr. J. H. Cunningham, who has been appointed on the staff of Manual Training Instructors in Toronto. Mr. Cunningham attended the Special Summer Course in Metalwork of this year, wrote off his outstanding examinations, and was granted the College Diploma and the Education Department's Certificate as Specialist.

The following took up supplementary work in Forging, Benchwork and Machineshop practice at the Special Summer Course:

Edward Faw, St. Thomas; A. J. Painter, Guelph; R. N. Shortill, Guelph; H. Winchester, Ottawa; J. Slaughter, Toronto.

Messrs. Faw, Painter, and Shortill sat for the theoretical examination, and the papers submitted proved highly satisfactory. They were given the College Diploma. The former is entitled to the Education Department's Certificate as "Specialist" and the latter to a certificate as teacher of Manual Training.

Mr. Winchester received the College diploma. Mr. Slaughter was given credit for his woodwork. He completed the practical part of the Metal-working Course, but did not take the examinations.

The following attended the Summer School and did some post graduate work in metal:

W. W. Snider, Ottawa; Chas. T. Yeo, Ottawa; D. H. Houston, Berlin.

In addition to the above there were in attendance at the Summer School thirteen taking the regular course in Constructive and Art work and twenty-eight Nature Study Students for two mornings a week.

Nature Study Correlated Course.—The aim is to afford the students attending the regular Nature Study Course opportunity to obtain a reasonable knowledge of the operations and manipulations of woodworking tools, Constructive and Art work, so far as their application can be adapted in dealing with simple construction and its correlation with the other lines of school work.

Number of students during Fall term, 1906, 11; Spring term, 1907, 12; Summer School, 1907, 28.

Optional Courses.—The instruction offered is mainly of a recreative character in Wood and Metal to meet the requirements of students attending the Home Economics Department who desire to spend profitably any spare period they may have from the regular course in Domestic Science.

Attendance during Fall term, 1906, 20; Winter term, 1907, 38; Spring term, 1907, 21; Fall term, 1907, 13.

There are thirty-five additional Domestic Science students receiving a regular course in Color and Household Decoration.

I have the honor to be, Sir,

Your Obedient Servant,,

JOHN EVANS.

PART XIX.

THE PROFESSOR OF NATURE STUDY.

To the President of the Ontario Agricultural College:

SIR,—I have the honor to submit my third annual report on the work of the Nature Study Department.

THE MACDONALD SCHOLARSHIPS.

Perhaps the chief matter of interest in this Department to report for the year 1907 is the closing of the College's direct concern with what has been generally known as "The Macdonald Movement." The three-year agreement whereby selected teachers from the five eastern Provinces were to be given free instruction in Nature Study and allied subjects ceased in June with the departure of the last interprovincial class. During this time a significant educational movement has been in progress. Two hundred and two Canadian teachers have been brought together into one institution from a territory extending over a length of 3,000 miles with the intent of re-directing the instruction in their schools to the common things of nature and life. For the three months of their courses, they lived together in the Hall; worked together in laboratory, workshop and garden; studied together in field, woods, campus, and classroom; tramped together along country roads and by streams; visited schools, factories, and College departments. The East became West, the West became East, and the middle widened to the two directions. They were times of educational expansion for individual teachers; sympathies broadened, outlooks widened, provincialism atrophied, national sentiment expanded.

Most of these teachers are now scattered in rural and urban schools throughout our land. And while we have no direct, regular account of their work, we hear indirectly from School Inspectors and irregularly from themselves of their success in handing down to their children some of the good things they themselves received at Guelph. Some are acting as supervisors of Nature Study in training schools, or in graded schools of towns. Many extend their influence amongst their fellow teachers by papers, or demonstrations at teachers' conventions. It may be fairly said that while the Macdonald Movement has ceased so far as classes in Nature Study at Guelph are concerned, it goes on in the common schools of the land wherever our teachers have gone. It was and is a national movement in education in which our College may feel proud to have taken part. For the continuance of it at the new Macdonald College at Ste. Anne de Bellevue our best wishes are extended. It is to be hoped that some day in the near future our provincial Departments of Education, acting conjointly with the Federal Government, may recognize and adopt some such scheme as this promoted by

Sir Wm. Macdonald as a very proper and necessary plan for bringing about a national unity in education. The following table shows the distribution of the teachers:

	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Extras
Fall, 1904.....	5	6	6	6	12	
Spring, 1905...	4	8	7	12	14	5
Fall, 1905.....	5	8	9	6	17	
Spring, 1906...	6	8	6	12	14	4
Fall, 1906.....	4	..	..	3	3	1
Spring, 1907...	6	..	..	5	..	1
Totals	29	30	28	44	60	11

The grand total was 202. The extra students entered the classes without nominations in Macdonald Scholarships. They came from the western provinces, England, and Ontario.

The Spring Class of 1907.

This interprovincial class, like that of the Fall term of 1906, was not very large nor representative. In Ontario, the scholarships were offered again, but owing to the scarcity of teachers and the consequent difficulty in obtaining substitutes, the lateness of the decision of the Department of Education to continue the scholarships, and the withdrawal of the supplementary grant by the Macdonald Rural Schools Fund for mileage and other expenses, no candidates were forthcoming. While the months of April, May and June are the best months for our work in Nature Study, as a rule they are the busiest in our schools and only a few teachers can feel free to leave their classes and enter on a course of study.

The class was composed of the following:—

Prince Edward Island:
Miss Frederica Campbell, Park Corner.
Miss Theodosia Gallant, Mt. Carmel.
Mr. Daniel S. MacInnes, St. Peter's.
Miss Eva W. MacMurray, Charlottetown.
Miss Evangeline Matheson, Dundas.
Miss Isabel Nash, Charlottetown.

Quebec:
Miss E. J. Ewing, Pike River.
Miss May G. Johnson, Levis.
Miss Henrietta Jones, Richmond.
Miss Frances Scott, Iron Hill.
Miss Lila M. Wainman, Shawville.

Great Britain:
Miss Minnie Hardy, East Dulwich.

The Nature Study Course and Elementary Agriculture.

The usual course of study as outlined in the College Calendar was taken. Visits were paid to all departments of the College and in most of them short courses of instruction were arranged for. In English, Prof. Reynolds took up the study of Canadian writers and the leading nature poets; in Physics, Mr. W. H. Day gave instruction in elementary meteorology, soil physics and in astronomy; in Chemistry, Prof. Harcourt gave instruction in soils and plant foods; in Bacteriology Prof. Edwards and Mr. Barlow covered a

practical course suitable to the needs of the public school teacher; in the Art work and Manual Training, correlated to Nature Study and School Gardening, Prof. Evans and Mr. Kendall gave the instruction; in Agriculture, Prof. Zavitz and Mr. Buchanan gave instruction in farm crops, experimental work, etc.; in Dairying, Prof. Dean and his assistants instructed in milk testing, care of milk, etc.; in Poultry, Mr. Graham took up work on the common breeds of domestic fowl and their care; in Animal Husbandry, there was instruction by demonstration and lecture in the breeds and care of farm animals by Prof. Day. In Horticulture, Prof. Hutt and Mr. Hunt took up plant propagation, improvement of school grounds; in Entomology, Dr. Bethune took the class for laboratory and field work; in plant study, Mr. Eastham assisted. It will thus be noticed that the whole College assisted in giving instruction to the Nature Study class in the elementary knowledge and principles of agriculture; it is towards this side of the subject that our Nature Study work here has been naturally tending. Indeed it is a question if it may not be more faithfully designated by the term Elementary Agriculture. Such a development accords with one of the fundamental working principles of Nature Study teaching, viz., to use for instruction the materials and means that lie near and enter into the concerns of our everyday lives. The students were surrounded by a College influence which was brought to bear on their education. This, instead of confining interests to one or two departments.

School Gardens.

Our out-door School Gardens were not so successful this term as previous gardens. This was owing to our having taken a new piece of poorly prepared ground to the east of the gardens of the Consolidated School. However, the success of school gardening is not measurable in garden products and our teachers probably received as much benefit, practically and pedagogically in the use of this adversity of soil as they would have had under kindlier conditions.

A School-Master's Garden.

The gardens were planned and planted this term as a schoolmaster's garden. This was to avoid the disorder that the gardens of previous classes fell into at term's close in June. While the experiment was a success so far as to attaining a better appearing garden in July, August and September, it went to show that teachers (and no doubt the same thing would obtain in children's gardening) have more interest and get more pleasure in a garden that is their very own, even if they must leave it before much growth is showing.

The term closed with a visit to Niagara Falls and Toronto. Special thanks are again due Mr. Gearie, of Niagara Falls, for his kindly interest in our visit to the battlefield at Lundy's Lane; there in the cemetery where the dead were buried and where monuments commemorate the victory and Laura Secord's daring deed, he graphically described all the details of the fighting. Afterwards he showed us many curios reminiscent of the early history of the Niagara peninsula. Needless to say, it was one of the best taught history lessons that our teachers had ever had.

For our inspection of The Ontario Power Company's plant, thanks are due Mr. J. W. Wilson, Superintendent of the Queen Victoria Park. At Toronto visits were made to the Normal School, the Colleges, and some of the Public Schools.

Summer Class of 1907.

By an arrangement with the Education Department, all the Summer School work for teachers this year—outside of that done by the University—was delegated to the Macdonald Institute. This was owing to the Normal Schools at London, Toronto and Ottawa being engaged in special courses for the teachers in Separate Schools. Arrangements were made for the lady teachers to board in Macdonald Hall, and new courses were offered in Domestic Science and Manual Training.

While the attendance in the three courses was larger than what we have previously had in Nature Study alone, it did not nearly equal the enrollment of summer schools at the Normal centres. Our teachers who take summer courses would seem to prefer to go to larger cities. They have still to learn that the attractions of our beautiful College surroundings and a few weeks' stay at the Hall fully compensate for the loss of the city's summer attractions.

The following composed the class:

Miss Beatrice Barber, Corinth.
" Elsie Blackmore, Toronto.
" Minnie Bennett, Acton.
" Mabel Book, Silverdale.
" Vivian Clayton, B.A., Listowel.
Mr. W. F. Darroch, Brantford.
Miss Isabella Duff, Lakefield.
Mr. J. P. Ferguson, Stirton.
Miss Marion Hamilton, Toronto.
Mr. John E. Hanlon, Guelph.
Miss Eva Henderson, Underwood.
" Minnie Holmes, Acton.
" Martha Langford, Cameron.
" Grace Mortimer, Guelph.
Mr. H. A. Munro, Toronto.
Miss Janet McKinley, Forest.
" Amy McKowan, Bond Head.
" Lillie McLean, Bowmanville.
Mr. Thomas Packer, Elmvale.
Miss Effie Polley, Sarnia.
" Marion Porteous, London.
" Libbie Porter, Sault Ste. Marie.
" May Neelands, Forest.
Mr. P. O. Nelson, Warkworth.
Miss K. S. Rolston, Caledonia.
" Ada Short, Toronto.
" Ida Smith, Petrolia.
Mr. John Urquhart, B.A., Dundalk.

The work of the summer class followed in general the course outlined in the Calendar. In school gardening we had the enthusiastic help of Mr. J. W. Gibson, who has had oversight of the Macdonald school gardens of Carleton County for the past three or four years.

The enjoyment and progress in the work was enhanced not a little by lodging the lady teachers in Macdonald Hall, and it is to be hoped this privilege may be continued; the demeanor of the class of 1907 proves there is little fear of the privilege being abused by infringement of College rules, even though the session is somewhat of the nature of a summer recreation.

Teachers' Conventions.

There have been three conventions of teachers held at the College during the year.

May 22 and 23—East Huron Teachers' Institute.

October 3 and 4—North Simcoe Teachers' Institute.

October 3—North Wellington Teachers' Association.

Special care is taken to make these visits pleasant and profitable to the teachers. As far as time permits, they are introduced to the many-sided operations of the different departments. Some are interested in one thing, some in another; but in every case something in the nature of a new idea or a new inspiration is taken back to the boys and girls in the public schools. This is in most cases the only "Agriculture in the Public Schools" presented in our schools. But an interest in the subject is quickening in the minds of many teachers and inspectors. In the meantime they are learning where and how they may be helped.

Visit of Dominion Educational Association.

On July 13th we had a visit from a party of representative Canadian teachers who had been in attendance at the Dominion Educational Association in Toronto. They were entertained at Macdonald Hall and after dinner impromptu addresses were made by delegates from the different Provinces. Our summer students enjoyed the experience very much.

The following comprised the party:

Nova Scotia:
Miss Blanche Atkinson, Maccan.
" Mary I. Moseley, Halifax.
" Mary F. Ball, 170 Portland St., Dartmouth.
Miss Mabel V. Bigney, Amherst.
" Anna L. Bigney, Amherst.
Mrs. E. J. Willis, Halifax.

New Brunswick:
Miss Isabel R. Everett, Fredericton.
" Margaret R. Graham, St. John.
" Fannie McLaren, Moncton.
" Maud Gibson, St. John.
" Ellen Barton, St. John.
Miss Catharine Barton, St. John.
" Mary Anderson, St. John.
" A. M. Hea, St. John.
" Ella L. Thorne, Fredericton.

Ontario:
Miss Eva Findlay, Sturgeon Falls.
" Annie Douglas, Uxbridge.
Mr. V. J. Murphy, C.S.B., Toronto.
Mr. F. G. Joblin, Toronto.
Mr. Thomas Packer, Elmvale.

Manitoba:
Miss Ada B. Speers, Brandon.
" A. Holden, Boissevain.
Mrs. J. H. Glover, Boissevain.
Miss Susie Youghusband, Winnipeg.
Mr. D. McDougall, Brandon.
Mr. B. J. Hales, Brandon.
Mrs. B. J. Hales, Brandon.
Miss Marion M. Hales, Brandon.

Saskatchewan:
Miss Effie Bready, Radisson.

British Columbia:
Mrs. Agnes Deans Cameron, Victoria (404 Marquette Bldg., Chicago).
Mr. C. McLean Fraser, Nelson.

Addresses on Nature Study subjects or Agriculture for the Public Schools have been given before the following:

May 17th—Teachers' Association, Stratford.
November 8th—South Essex Teachers' Association, Leamington.
November 15th—Haldimand Teachers' Association, Caledonia.

Visitors, Special Lectures, Etc.

Our classes, as usual, had the advantage of hearing special addresses by well-known men.

On May 11th Prof. C. A. Zavitz lectured on "A Visit to the United States and Europe."

On May 23rd, Mr. W. E. Saunders on "Bird Life."

On July 4th, the Ontario Entomological Society held a special summer session at the College, which was attended by our Nature students. The next day the members and students of the summer class fraternized at Puslinch Lake. Interesting addresses were given in Macdonald Institute by Dr. Fletcher of Ottawa on Natural History in the Schools, and by Dr. Skinner of Philadelphia on Disease-Carrying Insects, and in the field by Messrs. Williams, Brodie, and Nash of Toronto.

On July 19th Professor Reynolds gave a lecture to the summer school on Canadian writers, and on July 23rd, on Shakespeare.

On July 24th, Mr. W. D. Hobson, of Woodstock, gave us a talk on birds, imitating in a wonderful manner the songs of many of them.

On October 3rd and 4th Dr. Hogben, Director-General of Education for New Zealand, visited the College and kindly took part in the meetings of the North Simcoe Teachers' Association, which was in convention at the time. His remarks regarding the status and salaries of their teachers, the progress of school gardening and agriculture in the public schools, the successful workings of the teachers' pension fund, greatly impressed his hearers with the progressiveness of our fellow colonists of the southern seas in matters of education.

During the spring term the Wellington Field Naturalists' Club held its meetings in our Nature Study classroom and they were attended by our teachers-in-training with great profit, as much interesting nature material was reported on or brought in.

Training of Teachers Elsewhere.

This question of the special training of teachers for rural schools is being solved in different places in different ways.

In the Province of Quebec, the normal school has been removed from the city of Montreal and incorporated with The Macdonald College of Agriculture at Ste. Anne de Bellevue. The teachers-in-training receive special instruction in gardening and nature study and have a large part of their observation and practice teaching in village and country schools.

In Nova Scotia the provincial Normal School at Truro is affiliated with the Agricultural College and every student receives instruction in science subjects at the hands of the college staff. Besides this training in the normal term, a fourteen months' course is given leading to a Rural Science Diploma. It consists of a six weeks' summer term with a subsequent three months' spring term or as an alternative four summer terms of six weeks each. The instruction in the College is supplemented by home reading and investigation prescribed by the teachers.

In the State of Wisconsin there are sixteen authorized county training schools for teachers. The State makes a grant up to the amount of $2,500.00 for the maintenance of each. These schools keep in close touch with the needs of the rural schools by using adjacent rural schools for practice and observation, and according to Mr. P. Cary, State Superintendent of Education, "The schools have proved very satisfactory and are solving the problem of the trained teacher supply for rural schools of one department." The course of instruction is completed by the average student in two years. A similar plan is followed in the State of Michigan.

In the State of Oklahoma, recent legislation has made instruction in Agriculture in the public schools compulsory and teachers are required to qualify for the work. To meet this requirement the State Agricultural College has organized a "Correspondence Course" covering two years of nine months each. Texts are prescribed, "pointer questions" are sent to be answered, and the answer papers examined. The weakness in the scheme seems to lie in the lack of practical or experimental work.

In New Zealand teachers and high school pupils of the second and third years, wishing to qualify in the subject are required to undergo a departmental written examination. Before doing so, however, a certificate must be presented showing an approved course of instruction in practical agriculture. This practice work includes the operations of school gardening, experiments with plants and soils, etc. Moreover, as reported by Dr. Hogben,

Director-General of Education, "Elementary practical agriculture is a subject of instruction recognized for the purpose of grants for manual and technical instruction in primary and secondary schools. The courses to be approved should include practical instruction in school gardens, and other practical work. The grants made are 2s. 6d. per head, per annum; but a grant of 10s. per head up to £7 10s. is made in the first year. *The number of these classes is rapidly increasing.*" New Zealand is evidently reaching a general adoption of the work faster than any state or province in America. But they have a permanency in the teaching profession not approached here. The lowest salary paid in any school to any teacher is not less than $800 and a large proportion of the teachers are men. Moreover, the schools are, as a rule, provided with a master's residence.

At the Training College for state teachers in Melbourne, Australia, there is a special department of Nature Study. The work done here is chiefly along the lines of practical elementary agriculture. Teachers from South Australia and Western Australia, as well as Victoria, are in training at this somewhat federal training school. Evidently the work is favorably considered, as a writer in a recent "Education Gazette" claims, "Australia is giving a lead to all other countries in this important branch of popular knowledge." Possibly, the opinion is insular. But at any rate all over the world a movement to give teachers special training in elementary agriculture, is in operation.

Training of Teachers in Elementary Agriculture.

In recent years the fact has been recognized that the teaching of agriculture in our public schools cannot be accomplished satisfactorily through any text book scheme, no matter how good the book, even if the subject is made obligatory. The success of the work must, in the final analysis, depend on the enthusiasm and preparedness of the teachers. In Ontario our teachers are not prepared; they cannot be enthusiastic. At the present time, the subject seems to stand discredited in the public mind. The opinion is held that the teachers, being trained in studies foreign to farm concerns, are an impractical body of servants, and that consequently, our children's training in agriculture should best proceed through the time-honored home-training method.

The fact is that the incorporation of this study in our schools' curriculum has passed through the text-book phase. And moreover, that with properly qualified teachers, the school can instruct in elementary principles underlying the practice of agriculture that are quite unknown or faintly recognized by father or mother. As with the natural sciences introduced into our high schools it was realized there must be practical laboratory work if proper educational aims were to be accomplished, so now it is felt that agriculture in the public schools must be taught through the growing of plants and the handling of soils in school gardens or in home plots.

This is the present attitude of our Education Department in the matter. It has been given practical application in the offer of special money grants to school boards to enable them to buy land and build toolhouses, and to teachers to encourage them to qualify for the work and carry it on. The allowance to teachers is thirty dollars a year. To receive this it is necessary for them to acquire a certificate of qualification from the Macdonald Institute and teach the work to the satisfaction of the inspector.

At your request I drew up an outline of study to cover this required qualification. It is practically the course that has been developed for our three months' Nature Study classes, during the past three years. It is now stated specifically so that each department of the College may realize its share

in the plan and recognize it as one of the accepted College courses. While it may seem to be too comprehensive, it is to be considered as suggestive rather than obligatory. It is felt that the trained minds of teachers who might attend, can readily grasp the relative significance of Dairy Husbandry, Animal Husbandry, etc., while making their special study in Horticulture, School Gardening, etc. They should be sent away from us with a broad view of the meaning and scope of Agriculture.

In case that it is found that teachers can not get leave of absence for a spring term nor afford to meet the expense of the course, other arrangements will have to be made for summer sessions or correspondence courses. The proposed course and its accompanying regulation follows:

PROPOSED COURSE IN ELEMENTARY AGRICULTURE FOR TEACHERS.

Object of Course.

(1) To prepare teachers for meeting the requirements of the Education Department in regard to the teaching of elementary agriculture and horticulture through school gardens.

(2) To train rural teachers for rural schools by awakening interest and thought in the scientific principles and practices of modern farming so that the country and village schools may sympathize and direct in the life-interests of country boys and girls.

Nature of the Course:

The whole College equipment of garden and orchard, farm and experimental plots, stables and workshops, museums and campus, green houses and laboratories, forest nurseries and experimental bush, dairy and poultry farms will be at the service of students for observation and use.

The instruction will be given in lecture room, laboratory, workshop, garden, and field; the theory and demonstration of the lecture and laboratory will exemplify the out-of-door practice; it will be elementary in character, the pupil in the rural school being kept in view always.

Requirements for Admission:

The course is open to all teachers. Intending students are advised to prepare for the term's work by reviewing their science studies taken in high or normal school.

Applications:

Candidates should address applications to the President of the College.

Examinations:

Written and practical examinations will be held at the end of the term testing the candidate in the subjects prescribed. The term work as represented by garden practice, individual experiments, laboratory work, collections and written records will be largely considered in awarding a certificate.

Certificate:

The certificate will be known as a "Certificate in Rural Science."

Subjects:

Instruction will be given in Physics, Chemistry, Entomology, Bacteriology, Horticulture, Botany, Field Husbandry, Animal Husbandry, Poultry, Dairying, Gardening and Pedagogy; the following tentative time-table will suggest the allotment of time for each subject:—

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8.30–10.15	Physics	Entomology	Physics	Bacteriology / Animal Husbandry	Pedagogy	Gardening
10.15-12.00	Botany	Chemistry	Botany	Field Husbandry	Poultry / Dairying	Individual Work
1.30–3.30	Manual Training / Farm Carpentry	Horticulture	Botany / Forestry	Horticulture	Gardening	

Exemptions from Attendance:

(1) Teachers who have previously completed satisfactory three months' course in Nature Study will be awarded the certificate on passing the regular examination at the end of the term. and presenting the necessary plant, seed, weed, and insect collections; or the certificate will be awarded to such teachers as are successfully carrying on school garden work in their schools as attested by the Public School Inspector or College representative. This will be taken to mean that there are individual and experimental plots, forest nursery beds, etc., in the garden and properly co-related instruction in the school.

(2) Teachers who have completed satisfactory courses in High School Agricultural Departments (taking the garden work and making collections) as attested by certificate from the Principal will be granted the certificate on showing satisfactory evidence of carrying on garden work as above.

(3) Teachers who hold the Associate Diploma from the College will be granted the certificate on showing satisfactory evidence that they are carrying on garden work as above.

Partial Extra-Mural Course:

While it is felt that a three months' attendance at the College is highly desirable for gaining a proper insight into the nature of the work, it is realized that many teachers desirous of equipping themselves in this branch of school work may not be in a position to take advantage of the above course. To such teachers the following course might be offered:—

(1) To attend a July session as a preliminary preparation for the work.

(2) To follow a winter course of reading as specified under each subject prescribed below under direction and supervision from the College.

(3) To commence a school garden in the spring in which there are individual plots, flower borders, experimental plots with at least two of the Experimental Union experiments.

(4) To get plant, weed-seed and insect collections under way.

(5) To attend a second July session and take the examination at its close.

Teachers who have previously taken summer courses will find this option suit their needs. Such teachers will be exempt from work previously covered and will put their time on special studies; they will take the final examination, however.

This plan would enable teachers to gain their certificates within thirteen months and receive the bonus grant of thirty dollars for their first year's garden.

Course of Study.

School-Gardening: (Each student will have a garden for practice and observation).

History of its development abroad and in Canada; its aims as a school study; exhibitions; laying out of a garden; individual plots; class plots; teacher's plots; experimental plots; forestry plots; borders; keeping of tools; home gardens; keeping of garden records; observation in gardens at Marden School and Macdonald Consolidated School.

Texts and Reading:

Nature Study and Life—Hodge.
The Outlook to Nature—Bailey.
Among Country Schools—Kern.

BOTANY:

(1) Systematic:—Examination, description and classification of common economic plants of garden, field and forest with collection of 25 pressed mounts.

(2) Weeds:—Seed Control Act; study and identification of the seeds of 25 common weeds with collection of same.

(3) Plant Diseases:—Study and identification of common fruit, vegetable and grain diseases; laws regarding Barberry, Black Knot, etc.; application of preventatives and remedies. Collection.

(4) Physiological:—Experimental and observation work:—

The Seed: Testing the vitality; determining the condition necessary for germination, how the seedling becomes established.

The Root: How roots grow, their function; how they absorb food and water; proof of their using air and giving out carbon dioxide; quantity of water absorbed.

The Leaf: The function of leaves; control and measure of transpiration; respiration; starch-formation; behavior in light and darkness.

The Stem and Buds: Forms, structures and functions of stem and buds; influence of temperature, moisture, light on growth; how the sap circulates.

The Flower and Fruit: The functions of the parts of flowers; causes controlling the opening and closing of flowers; pollination; formation of fruits; devices for protecting and dissemination of seeds; cross fertilization; plant breeding on experimental plots.

In the physiological experiments individual students will be assigned special subjects which they will demonstrate to their classmates after completing them.

Texts and Reading:

Spotton's Botany (new edition).
College Bulletin on Weeds.
The Farm Weeds of Canada—published by Dominion Government.
Experiments with Plants—Osterhout.
Botany—An Elementary Text Book—Bailey.

HORTICULTURE:

(1) Development, importance, needs and outlook for the fruit industry; governmental interest and action regarding shipping, marking, cold-storage, fumigation of nursery stock; experimental stations, co-operative tests in Experimental Union.

(2) The principles of gardening of vegetables, flowers and fruit.

Practical and Observational:

Preparation and care of land; hot beds and cold frames; fertilizers and compost heaps; cultivation of annuals, perennials, and bulbs; artificial reproduction by cutting, budding, grafting, layering; the care of fruit trees and orchards, pruning, cover-crops, etc.

Texts and Reading:

The Nursery Book—Bailey.
Principles of Fruit-growing—Bailey.
Fruits of Ontario—Ontario Department of Agriculture.
Vegetable Gardening—Green.
Home Floriculture—Rexford.

FORESTRY:

Development of forestry work in other countries; value of lumbering industry; Canada's conditions and needs; laws and regulations regarding re-forestation and forest-preservation; the establishment, care and protection of wood lots.

Practical and Observational:

Identification of our Forest trees; planting seed-beds in school gardens; work in College nursery, and in the experimental bush; collections of weeds, etc.

Texts and Reading:

A First Book of Forestry—Roth; Ginn & Co.
Bulletin No. 24, Forest Service, U. S. Department of Agriculture.
Sylvan Ontario—Muldrew; Briggs, Toronto.

FIELD HUSBANDRY:

Importance of field crops in the national economy; systems of farming; rotation of crops; fertility of the soil; cultivation of the land; classes of farm crops; uses of farm crops; varieties of farm crops; selection of plants; selection of seeds; structure of seeds; improvement of crops by means of selection and hybridization; practical tests in connection with Experimental Union; study of work being done in experiments with farm crops in Canada and in the United States.

Practical and Observational:

Examination of field crops on neighboring farms; the work on the experimental plots; farm crops in the school garden; the agricultural museum; laboratory study of the root development of farm crops; types of seeds of grains, grasses, clovers, roots and fodder crops; germination of seed.

Texts and Reading:

Reports and bulletins on field crops of the Agricultural College; Cereals of America, Hunt; Forage Crops, Voorhees; The Story of the Plants, Grant Allen.

BACTERIOLOGY: (Lectures and Laboratory Work.)

Lectures, demonstrations and laboratory work, exemplifying the work of bacteria in soil, dairying, plant and animal diseases; Government regulation regarding tuberculin tests, killing of diseased cattle, stamping out of hog cholera, meat inspection, etc. An experiment on soil inoculation in the school garden.

Texts and Reading:

Agricultural Bacteriology—Conn.
The Story of Germ Life—Conn.

PHYSICS: (Lectures and Laboratory Work):—

Physical nature of soils, soil moisture, heat and air; principles of tillage and systems of drainage and cultivation; measurements of fields with the chain; identification of samples of soils; principles of common farm machines; meteorological records.
Collection:—Typical soils in vials.

Texts and Reading:

The Soil—King.
Engineering for Land Drainage—Elliott.
Surveying—Baker & Dickson.
Meteorology—Davis.

CHEMISTRY: (Lectures and Laboratory Work):—

(It is assumed that students will have a knowledge of elementary chemistry.)
Agricultural chemistry; plant growth and composition; soils; manures and fertilizers; insecticides and fungicides.

Texts and Reading:

Chemistry of the Farm—Warrington (first five chapters).
Fertilizers—Voorhees.
Plant Life—Masters.

ENTOMOLOGY:

Losses through insects in agriculture and horticulture; governmental interest; classification of insects and laboratory study of types; common, beneficial, and noxious insects; out-door study and collecting in field, garden, orchard and forest; insecticides; a collection of properly mounted and labelled specimens is required.

Texts and Reading:

Chittenden's "Insects Injurious to Vegetables"—Orange Judd Company, New York.
Needham's "Outdoor Studies"—American Book Co., N.Y.
College Bulletins 150, 158.
Reports of Entomological Society.

ANIMAL HUSBANDRY:

Development, importance, status of the industry in Ontario; histories and characteristics of principal breeds of live stock; types; stabling and care.

Practical and Observational:

The College stables and herds; judging with score cards.

Texts and Reading:

Types and Breeds of Farm Animals—Plumb.
Principles of Breeding—Davenport.
Judging Live Stock—Craig.

Dairy Husbandry:

Development, importance, needs, outlook, governmental interest and action; markets and competition; dairy breeds; caring and stabling; individual cow-testing; care of milk and cream.

Practical and Observational:

Process of Cheddar cheese making, curing, boxing, labelling, shipping. Process of buttermaking, printing, shipping, milk-testing with lactometer and Babcock test; milk separation with hand separator.

Texts and Reading:

Annual Reports Dairymen's Association of Ontario.
The Elements of Dairying—J. W. Deeker.
Cheese-making—J. W. Deeker.
Testing Milk and its Products—Farrington & Woll.
Canadian Dairying—Dean.
Modern Methods of Milk Testing—Van Slyke.

Poultry:

Development and importance of poultry industry in Canada; markets and competition; governmental interest and action; common breeds; feeding, housing; incubation; individual testing by trap nest; preservation of eggs.

Practical and Observational:

Natural and artificial hatching of chicks; care of young in brooders, feeding, etc.

Texts and Reading:

First Lessons in Poultry Keeping—Poultry Pub. Co., Boston.

Manual Training (Farm Carpentry):

Making insect box, garden stakes, plant-press, dibbles, germination boxes, ladders for fruit picking; trap nests; line-reels; cutting glass; puttying for hot beds; painting; mixing of paints; care of brushes; sharpening hoes; inserting handles in spades; care of tools; sharpening knife and saws; making knots and splices.

Texts and Reading:

Woodworking for Beginners—Chas G. Wheeler.
Benchwork—W. F. M. Goss.
Every Man's Own Mechanic—Spon.

Agricultural High Schools.

The solution of the problem of introducing agriculture into the rural schools will be partially solved by the introduction of the subject into high school courses. In this regard, Ontario is at a critical period. It is to be hoped that from the experiment in the high schools at Essex, Galt, Collingwood, Lindsay, Morrisburg, and Perth, a widespread interest in agricultural teaching in our secondary schools may result.

While secondary schools of agriculture have been in operation for many years in Great Britain, Germany, France, Japan and other foreign countries, it is only in recent years that they have been known in America. There are two in the State of Wisconsin, one in Minnesota, and others are projected in other States. There appear to be two general plans of organization developing. In some cases the schools are to be established as distinct secondary technical schools. In other cases, the establishment is to be along the lines followed in our Province: that is, to make them a part of the regular high school.

That the adoption of these schools in the State Schools system is being taken up enthusiastically is shown by the history of the movement in the State of Georgia. In 1906 an Act was passed in the General Assembly authorizing the establishment of a District Agricultural High School in each Congressional district as a branch of the State College of Agriculture. Provision for maintenance was made by setting apart fees arising from the inspection of fertilizers, oils, etc. Bids in land and money grants were called for from each district, and for the eleven schools the total value of the bids was nearly $850,000 and the rejected bids amounted to fully as much. Thus the establishment has been made a local affair and insures a direct interest in their support. In no case was less than 240 acres of land donated and the money bonuses were as high as $60,000.

These Georgia schools will be organized somewhat after the plan of our College. The course is one of four years, and students will be given practical work about the farm and in the workshops as well as classroom and laboratory instruction. They may be paid for this service, thus reducing the cost of their courses. Some students will remain during the summer to help carry on the farm work. Provision is being made, too, for courses in home sciences and arts for girls. While agriculture is the specially emphasized subject in the school work, a good general English education is provided for.

Generally speaking, however, agriculture in the secondary schools in the United States, is being introduced as in Ontario. It is being established as an additional branch of work in the ordinary high school. At St. Louis, Michigan, high school, the class in agriculture is the largest class in the school. In Missouri, the State superintendents report that agriculture is taught in two hundred of the high schools; in Ohio there are thirty high schools taking the work; in more than twenty other States there are one or more high schools giving instruction in agriculture.

S. B. McCREADY.

PART XX.

THE LIBRARIAN.

To the President of the Ontario Agriculture College:

SIR,—I have the honor to submit herewith the report of the library for the year 1907.

During the past year 1,016 books have been added to the library, 192 of which have been magazines, reports and bulletins that were bound, and the remainder are classified as follows:

Agriculture	73	Bacteriology	19
Horticulture	38	Entomology	9
Forestry	16	Ornithology	5
Veterinary Science	12	Geology	16
Dairying	4	Physics and Meteorology	18
Poultry	3	Chemistry	20
Zoology	13	General Science	20
Botany	48	Agricultural reports	31

Horticultural reports	6	History	27
General Science reports	19	Biography	17
Domestic Science	22	Description and Travel	12
Hygiene	16	Ethics and Religion	4
Education	22	Fiction	4
Nature Study	4	Literature	117
Manual Training and Drawing	22	Reference books	17
Useful Arts	26	General reports	11
Economics	42		

The following reference sets have also been added:

Bailey, L. H.—Cyclopædia of American Agriculture, v. 1 and 2.
Bailey, L. H.—Cyclopædia of America Horticulture.
Bible Encyclopædia.
Cambridge Modern History.
Cyclopædia of Drawing.
Cyclopædia of Modern Shop Practice.
Modern Encyclopædia.
Ridpath Library of Universal Knowledge.
Tennant, J. A. (editor)—Photo Miniature, 15 v.
U.S. 12th Census and Statistical Atlas.

We wish to express our appreciation of all our exchanges, especially of the United States Department of Agriculture, the Experiment Stations of America, Australia, Cape Colony, Japan, India, South America and Europe; and our gratitude for the following gifts:

From Rev. Dr. J. C. S. Bethune:

The Works of the English Poets.
Bohn's Standard Library, 6 v.

From the Co-operative Wholesale Society, Montreal.

Eight volumes of their Annual.

From Mr. G. C. Cunningham, O.A.C.:

The Papers and Minutes of the Colonial Conference, 1907.

On the resignation of Miss Alice Rowsome as librarian, I succeeded to the position October 8, 1907. Our plans for the coming year include reclassifying of the books of the library in so far as is necessary to make the subjects more clearly allied; and arranging them alphabetically in those classes. This will bring together the different copies of the same work, and also the various books by one author on the same subject, so that it will be easier to find the particular books wanted. We shall also make reference lists of the material in the library on subjects called for by the various classes and debating societies which cannot readily be collected from the catalogue and magazine indexes.

Arrangements have been made with the Macmillan Co., of Toronto, by which they will send on approval such books as they wish to recommend to our notice. This will enable the heads of the Departments to see, soon after they are published, many of the new books on their subjects, and to know the more readily what to recommend for the library.

I wish also to speak with appreciation of the excellent way in which the assistant librarian, Miss Margaret Frew, carried on the work of the library after Miss Rowsome's departure, and the helpful way in which she assisted me in beginning my work.

I have the honor to be, Sir,

Your obedient servant,

EDITH C. DWIGHT.

PART XXI.

THE PHYSICIAN.

To the President of the Ontario Agricultural College:

SIR,—I have the honor of again presenting to you my annual report.

Last winter much sickness prevailed over this part of Ontario. The College had its full share of the ailments with which the community in general suffered. There were many cases of "sore throats," influenza, bronchitis, and the usual number of minor accidents. In addition, the College suffered from an outbreak of measles among both sexes. In all, eighteen cases occurred. The disease was brought in by a young man who evidently received the infection while away on his Christmas vacation and after his return was taken ill about the middle of January. Though many of these patients were quite ill, no serious complications occurred. During the months of March and April three students were obliged to enter the hospitals of the city for treatment. One of these suffered from an acute attack of appendicitis, for which he underwent operation and made a satisfactory recovery.

Thus far this autumn this part of the Province has been remarkably well, and I am glad to be able to report the same of the College. A case of appendicitis occurred in a young lady in Macdonald Hall. Otherwise, no serious illness has occurred up to the present. I have been obliged, however, to advise hospital treatment in three instances,—in one of the maids and two of the students. The latter were suffering from ailments which required operative treatment.

The attendance at the College this year has reached a new high record and many have been obliged to find accommodation outside the institution. To provide for this increasing attendance you have added to the dormitory twenty excellent new rooms, which, after reserving two for hospital purposes, as at present, will accommodate thirty-seven students, and you have enlarged the dining-room to meet the needs of the College in that respect.

I cannot close without referring to the large, suitably furnished sitting-room which this year has been provided for the students and which cannot fail to add to the comfort and enjoyment of their College life.

Respectfully submitted,

W. O. STEWART.

Guelph, Ont., Nov. 27, 1907.

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Twenty-ninth Annual Report

of the

Ontario Agricultural and Experimental Union

1907

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.)

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1908

WARWICK BRO'S & RUTTER, Limited, Printers,
TORONTO.

To the Honourable SIR WILLIAM MORTIMER CLARK, K.C.,
Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

I have the pleasure to present herewith for the consideration of your Honour the Report of the Agricultural and Experimental Union for 1907.

Respectfully submitted,

NELSON MONTEITH,

Minister of Agriculture.

Toronto, 1908.

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MEMBERS FOR 1908.

The following list of members includes all of those who are or have been connected with the Agricultural College, and have paid the annual membership fee for the present year. It is quite distinct from the list of co-operative experimenters, of whom there are now over 5,000.

Aldwinckle, E. W., O.A.C., Guelph.
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Angle, P. E., Fork's Roard.
Arkell, H. S., Macdonald College, Que.
Arkell, T. R., Arkell.
Arnold, J. H., Easton's Corners.
Augustine, H. W., Burnaby.
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Campbell, J. A., Simcoe.
Campbell, M., Komoka.
Campbell, M., Zimmerman.
Canby, F., Burnaby.
Carleton, J. A., Avening.
Carlaw, Geo., Warkworth.
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Carroll, J. A., Middlemiss.
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Clark, A., O.A.C., Guelph.
Clark, G. H., Can. Bldg., Ottawa.
Clark, E. E., Meaford.
Clark, T. O., Calgary, Alta., (Box 1906).
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Culp, S. H., Vineland.
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Cunningham, H. C., Ottawa.
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Duncan, R. S., Huntsville.

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Evens, N., Randolph.
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Fairbairn, J. B., O.A.C., Guelph.
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Foster, N., Toronto.
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Freek, E. M., Barrie.
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Fulmer, H. L., O.A.C., Guelph.

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Gandier, S. H., Lion's Head.

MEMBERS FOR 1908.—*Continued.*

Garrigus, H. L., Storrs Sta., Conn.
Gilmour, J. D., Doe Lake.
Goble, F. W., Woodstock.
Gordon, D., Elora.
Goulding, G. C., Vernon, B.C.
Graham, R. R., O.A.C., Guelph.
Graham, W. R., O.A.C., Guelph.
Grant, A., O.A.C., Guelph.
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Green, R. W., O.A.C., Guelph.
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Gunn, R. E., Beaverton.

Haight, W. L., Conway.
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Harris, C. H., Rockwood.
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Jones, D. H., O.A.C., Guelph.
Jones, J. W., Pownal, P.E.I.
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McCallum, J. M., Shakespeare.
McCarthy, D. J., Kingston.
McConkey, N. H., Bayham.
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McKenzie, A. G., Fairview.
McKenzie, D., Nutana, Sask.
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McRae, C. M., Ottawa.
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Main, C., Sheffield.
Manton, G., Eglinton.
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Murray, J., Brandon, Man.
Murray, J. E., O.A.C., Guelph.

MEMBERS FOR 1908.—*Continued.*

Naismith, J., Stratford.
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Neville, S. J., Cottonwood, Sask.
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Nixon, C. C., St. George.
Nunnick, C., Scotland.

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Owen, W. C., Thornton.

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Palmer, W. E., Marshville.
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Ralph, C. H., O.A.C., Guelph.
Raynor, T. G., Ottawa.
Reaman, G. S., Buttonville.
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Reeds, W. R., O.A.C., Guelph.
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Reynolds, J. B., O.A.C., Guelph.
Rice, F. H., Essex Jct., Vermont.
Riley, J. J., Jr., Graham, Que.
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Robertson, M., St. Marys.
Robertson, G., Ottawa.
Robertson, G. A., St. Catharines.
Robinson, E., Guelph.
Rogers, D. C., Kingston.
Rose, D. M., O.A.C., Guelph.
Ross, W. A., O.A.C., Guelph.

Salkeld, D. G., Goderich.
Sanders, G. E., Urbana, Ill.
Schartow, C. H., Toledo, Ohio.
Schuyler, C., Brantford.
Schuyler, R., Jarvis.
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Sheahan, T. A., Newark.
Shepherd, F., Bloomingdale.
Shibley, C. S., Harrowsmith.
Shortill, R. J. R., Ballinafad.
Shuh, C. H., Waterloo.
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Sirrett, R. W., Rosseau.
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Smith, W. H., Dutton.
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Stratton, R. W., O.A.C., Guelph.
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Strong, W. J., O.A.C., Guelph.
Summerby, W. L., Russell.

Taylor, F., Cumberland Mills, Que.
Taylor, G., O.A.C., Guelph.
Taylor, S., Todmorden.
Templer, W., Jerseyville.
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Thompson, Hugh, jr., Magnetawan.
Thompson, R. G., Boharm, Sask.
Todd, S. E., O.A.C., Guelph.
Toole, A. A., Mt. Albert.
Toole, W., Whitevale.
Treherne, R. C., O.A.C., Guelph.
Trethewey, J. E., Port Hammond, B C.
Tucker, H. S., Chapman.
Twigg, C. B., New Denver, B.C.

Waddell, W. M., Kerwood.
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Walker, W., O.A.C., Guelph.
Ware, J. T., Allenburg.
Warren, F. B., Gamebridge.
Webster, H B., Science Hill.
Weekes, H. M., Glencoe.
Wells, E. A., Chilliwack, B.C.
Wenger, A. A., Ayton.
Westover, C. A., Frelighsburg, Que.
Westover, M., Frelighsburg, Que.
Weylie, D. B., Glanford, Sta.
Whale, J. B., Goldstone.
Wheaton, R. R., Thorndale.
Wheeler, H. C., Hubbard, O.
Whetham, C. A., Kirkwall.
White, E. F., Cincinnati, Ohio.
White, O. C., Ashburn.
Whiteside, A. E., O.A.C., Guelph.
Whyte, G. G., Tuxford, Sask.
Whyte, M. I., O.A.C., Guelph.
Wiancko, A. T., Lafayette, Indiana.
Wiancko, T. A., Sardis, B.C.
Widdifield, W. J., Uxbridge.
Wilkinson, P. J., Cambray.
Williams, A. L., Corbetton.
Williams, M. G., Islay, Alta.
Williams, W. E., Clandeboye.
Wilson, A. C., Aurora, Ill.
Wilson, E. E., Caledon.
Wilson, S., Rolling Dam, N.B.
Winslow, R. M., Chelsea Green, London.
Winter, M. H., Wicklow.
Wolverton, H. A., Nelson, B.C.
Wood, G. B., O.A.C., Guelph.
Woods, J. L., Stratford.
Wright, C. H., Agassiz, B.C.

Yamagucki, M., O.A.C., Guelph.
Yarwood, E. B., Picton.
Young, G., Waubuno.
Young, J. C., O.A.C., Guelph.

Zavitz, C. A., O.A.C., Guelph.
Zavitz, C. J., Forks Road.
Zavitz, E. J., O.A.C., Guelph.
Zavitz, H. V., Coldstream.

ONTARIO AGRICULTURAL AND EXPERIMENTAL UNION.

OFFICERS FOR 1907-1908.

President.....G. A. Brodie, Bethesda, Ont.

Vice-President.....J. O. Laird, Blenheim, Ont.

Secretary and Editor.....C. A. Zavitz, Agricultural College, Guelph.

Assistant Secretary.....J. Buchanan, Agricultural College, Guelph.

Treasurer.....H. L. Hutt, Agricultural College, Guelph.

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Auditors.....J. B. Fairbairn and W. J. Squirrell.

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Horticulture.....Prof. H. L. Hutt, (Director), H. S. Peart, J. W. Crow.

Poultry.....W. R. Graham, (Director), G. A. Robertson, W. A. Brown.

Forestry.....E. J. Zavitz, (Director), R. D. Craig, E. C. Drury.

Chemistry.....Prof. R. Harcourt, (Director), A. E. Shuttleworth, W. P. Gamble, Geo. McCalla.

Apiculture.....R. F. Holtermann, (Director), E. M. Husband, C. C. Nixon.

TREASURER'S REPORT, 1907.

Receipts.

Balance from 1906	$	729 48
Membership fees, 342 at 50c		171 00
Government grant		2,500 00
Total		$3,400 48
Balance due Treasurer		104 35
		$3,504 83

Expenditure.

Agricultural experiments	$1,543 43
Horticultural experiments	1,735 75
Chemical experiments	50 00
Poultry experiments	5 25
Part expenses annual meeting 1906	71 40
Part expenses annual meeting 1907	99 00
Total	$3,504 83

We, the undersigned auditors, declare that we have examined the Treasurer's accounts and find them correct.

R. W. Hodson,
J. B. Fairbairn,
Auditors.

December 7th, 1907.

ONTARIO AGRICULTURAL AND EXPERIMENTAL UNION.

ANNUAL MEETING.

The twenty-ninth annual meeting of the Ontario Agricultural and Experimental Union was held at the Ontario Agricultural College, Guelph, on Monday, Tuesday, and Wednesday, December 9th, 10th, and 11th.

The President of the Union, Mr. J. M. McCallum, Shakespeare, Ont., presided over the regular sessions, and Mr. G. C. Creelman, President of the College, at the annual banquet on Tuesday evening.

SECRETARY'S REPORT.

Since the last annual meeting of the Experimental Union, three meetings of the board of control have been held, the Report for 1906 has been issued, some progress has been made in reference to securing a law to regulate the sale of feeding-stuffs, and a larger amount of co-operative experimental work has been conducted than in any previous year. I wish to express my gratitude to Mr. J. Buchanan, the Assistant Secretary, who did the Secretary's work entirely in 1906 during my absence, and who gave excellent help in the work of the past year.

In 1907, nearly 8,000 farmers, fruit-growers, gardeners, poultry-raisers and bee-keepers conducted co-operative experimental work at their own homes through the medium of the Experimental Union.

In Horticulture, the co-operative work of the past year was about twice as great as in 1906, four times as great as in 1905, and five times as great as in 1904. It now includes experiments with vegetables, as well as those with small and with large fruits. The total number of co-operative experimenters in Horticulture for the fourteen years, from 1894 to 1907, is 8,136.

In Agriculture, the co-operative work has been very extensive in its operations and influential in its results. The number of experimenters in 1907 reached over 4,000, and that for the twenty-two years, from 1886 to 1907, inclusive, 45,065.

The departments of Forestry, Bee-keeping, Poultry-raising, and Agricultural Chemistry have been doing good work, and the reports of the co-operative experimental work in these departments, as well as those in Agriculture and Horticulture, should prove both instructive and helpful.

The experimenters deserve great credit and sincere thanks for the excellent work which they are doing, not only for themselves and their neighboring farmers, but also for the general improvement of the agriculture of our country. The average increase in the yield of grain per acre for the three principal cereals grown in Ontario for the ten years, from 1897 to 1906, inclusive, over the average field per acre for the ten years, from 1887 to 1896, inclusive, is fully 18 per cent. This increase is undoubtedly due to a number of causes. The work of the Experimental Union, however, has surely exerted a marked influence by the introduction of superior varieties of crops and in the encouragement of improved methods of farming.

It must be remembered that all experimenters are not equally successful in their work, and especially is this true in the earlier stages of their experience. Many, however, become quite expert in their work. We find that no less than 1,693 experimenters have made good reports of successfully conducted experiments in each of two or more years previous to 1907. The Experimental Union has now an excellent corps of experimenters. Some of these combine the practical experience obtained on the farm, the educational training secured at the Agricultural College, as well as the special training furnished by successfully conducting co-operative work on their own farms for a number of years in succession. Some of the men have furnished good reports of successfully conducted experiments in each of ten or more years.

I firmly believe that the co-operative work of the Experimental Union will continue to grow in efficiency and in influence, and that similar work will gradually spread over many of the countries of the world, as its true value becomes better known and more thoroughly understood by the people. A somewhat similar organization to our own has been started recently in Scotland, and in each of at least seven of the States of the American Union. Under date of September 11th, 1907, I received a letter from Professor R. G. Greig, of the Agricultural College at Aberdeen, Scotland, from which I quote the following:—"Our work here is extending, and it will interest you to know that we have started an Experimental Union, but as yet of course on a small scale." Only the other day I received a letter from Professor Bailey, of Cornell University, in which he says, "I look upon your Experimental Union as the leader in this kind of work," and also another from R. W. Silvester, President of the Agricultural College at Maryland, in which he says, "I feel sure you are in closer touch with the active farmers in the Province of Ontario than is the case with any other institution in the western hemisphere." Probably most of the farmers of Ontario, when carrying out their individual experiments at their own homes, do not realize that the very work they are performing so faithfully is not only helpful to themselves and to their fellow farmers, but that the whole movement is being watched and even followed by the people of other countries. It is gratifying to know that the Experimental Union is exerting a wholesome influence in various ways. May the work of the past encourage us to press forward in a humble but hopeful and persistent manner to better and greater things in the future, and to thus make our work more perfect and more worthy of imitation.

PRESIDENT'S ADDRESS.

By J. M. McCallum, Shakespeare.

Again the wheel of time has turned, and finds us here at the 29th annual meeting of the Ontario Agricultural and Experimental Union. These annual meetings are milestones, marking the successive steps in the extension and progress of one of the great educational features of advanced agriculture in the Province of Ontario. In fact, the Experimental Union, emanating as it does from the Agricultural College, and emphasizing the principal results of research and investigation at this Institution, may be considered the pioneer, the bulwark, as it were, of the agencies working for a purpose, that purpose being the improvement of the agriculture of Ontario. What the Live Stock Associations of Canada are to the practice of animal husbandry, the Experimental Union is to the development of plant husbandry.

It is said that "In any great work there is no such thing as standing still," there must be either progress or retrogression. The record of the Union is one of continued progress from a very small beginning until the present time, when its full schedule of co-operative experimental work covers many fields of practical agriculture. Standing as we do at the close of another year, and looking backward over our work since our last meeting, we have good reasons for considering the past year a very successful one. The number of experimenters has increased, new lines of co-operative experiments have been introduced, and the reports, on the whole, indicate a steady appreciation of the experimental work. In one sense, the past year has been a most valuable one for variety testing; the dry season, and the presence of a blight on some of our crops being a first-class test of varieties for withstanding such conditions. It is in just such a season that the really strong features of good varieties are demonstrated.

In considering the whole work of the Union during its thirty years of existence, questions, such as the following, naturally arise: What are the material benefits of co-operative experimental work? Has the work of the Union furnished any real assistance in the progressive march of agriculture in Ontario? To the latter, I reply unhesitatingly and emphatically, yes, and to the former I say that the principal material benefits are five-fold, to say nothing of the numerous minor benefits resulting from participating in these co-operative experiments. In the first place, it furnishes in all of our crops the basis for the supply of pure seed, of the very best varieties, selected by competitive tests and adapted to existing conditions of soil and climate in this province. In this respect alone, the great results fully justify the continuance of the work. Secondly, it demands care and precision on the part of the experimenter, and encourages that attention to detail which leads to the very highest success in any branch of business, and particularly so in agriculture. Thirdly, it cultivates the habits of study and observation, the thoughtful summing up of results, which adds to a man's value as an experimenter. Fourthly, it has developed a bond of union, a feeling of kindred helpfulness among the seven thousand or more experimenters, and lastly, all of these may be summed up and stated in the one sentence—it adds to the agricultural status of our Province, keeping it well advanced in agricultural achievement.

Probably a brief glance at the present agricultural situation in Canada would not be out of place. At no period in the history of Canadian agriculture has there been such unbroken prosperity as during the past decade. It has been marked by phenonmenal increase in agricultural population and production and by a greater increase in the foreign demand for our products. Transportation facilities have undergone a much-needed improvement; trade relations have broadened and strengthened; in short, we may say that "agriculture has been booming." Keeping pace with this unprecedented growth in practical agriculture has been the growth in agricultural education throughout the Dominion. The Agricultural College sentiment appears to have spread from the Atlantic to the Pacific, and it pleases us to hear and read of the very satisfactory patronage which accompanies this sentiment. At this, the oldest of our agricultural institutions. the attendance is ever increasing, and "insufficient accommodation" is still the cry. The younger colleges, in Nova Scotia, Manitoba, and at Ste. Anne de Bellevue, are in a most flourishing condition, and there is every probability of another being established in one or other of the new provinces in the West. Moreover, agricultural instruction has been introduced into six of our Ontario High Schools. Truly these are growing times in Canada. Yet there are several problems confronting the agriculturist.

Transportation needs a still further improvement to insure the marketing of our fruit and dairy products in first-class condition. The problem of disposing of our products by some co-operative method is one which might well engage close consideration. The spread of noxious weeds causes us much uneasiness. The labor problem is really the most complex one confronting the farmer. Great as has been the tide of agricultural immigration, there is really a dearth of first-class farm labor, and a corresponding high water mark in its cost. However, just as a spot on the canvas serves to enhance the true brilliance of a picture, so the real brightness of our agricultural outlook is established by these problems. I cannot leave this subject of agricultural progress in Canada without referring to the magnificent victory gained by the O.A.C. judging team at Chicago last week. On behalf of the Experimental Union, I extend to President Creelman and staff of this College our heartiest congratulations on the brilliant work done by the team there. For three years in succession, in spite of recognized disadvantages, the students of the O.A.C. have demonstrated their superiority as live stock judges, and have firmly clinched the right to be permanent possessors of the fine torphy. The fact is now fully established that Canadian agriculturists, trained in a Canadian Agricultural College, are invincible when pitted against the best which America can produce.

Notwithstanding the fact that the Union is doing a great work, I believe that its field of usefulness can be enlarged. We all know that our province has a variety of soils, and, that to quite an extent, different soils exhibit different suitability for different varieties. For example in the growing of potatoes we have seen that certain varieties thrive best in the lighter soils characteristic to certain districts, while other varieties give best results in the heavier soils, and in the Muskoka districts, where they grow the finest potatoes I have yet seen, still other varieties stand in highest favor. Further, we know that there is quite a difference in the length of the growing season in different parts of the province, requiring the use of different varieties. For instance I would point out the necessity of growing different varieties of corn in different parts of the province. We must admit that it is inadvisable to grow in the northern parts of Western Ontario those varieties of corn which are in highest favor in Essex County. Moreover, I believe that the province could very easily be divided into three or four districts, depending on the soil and length of season. Therefore, I make the suggestion that in future published reports, the results of co-operative experiments be printed to show which of the varieties under experiment give the best results in these different districts. This means, certainly, an increase in the work at the department here and the addition of extra work in preparing the reports, but in consequence of this I feel tolerably sure that our Agricultural Department will increase the grant to the Experimental department accordingly. Further still, I believe that the following out of this scheme will result in strengthening the bond between the Experimental Union and the farming public, and will increase the benefits to be derived from the already efficient system.

One more suggestion and I have finished. The Ontario Agricultural and Experimental Union is the most adaptable medium for promoting the consolidation of the agriculturists and agricultural interests in the province of Ontario. When we consider how the manufacturers are combined to secure the most favorable conditions, legislative and otherwise, for promoting their own interests, and when in comparison we remember that this is essentially an agricultural country, especially favored by natural conditions for agricultural pursuits, then to our minds comes the thought that things are

misadjusted. In the first place, farmers have inadequate representation in parliament in comparison to their numbers, and the great importance of their work in Canada. In the second place there is altogether too much individualism in the farming public—too great a prevalence of that one-man idea—displaying a deplorable lack of organization and co-operation, which lack has been to our own detriment. Then again, we often find that wholesome healthy rivalry among farmers interrupted by petty jealousies, thereby preventing the attainment of the highest good. In short, the prosperity of late years seems to have produced the sentiment "give all thought and attention to your own little world, and let the general good look after itself." But in the face of all this, and counteracting it to a certain extent, stands out prominently the work of the Experimental Union. By its growth, union and co-operation is secured, at least among its members. Farmers generally, recognize the true value of the work done by it, and would, I believe, follow its lead and be influenced by it as they would by no other organization existing in this Province to-day. A consideration of this thought, and a hopeful view of its feasibility opens to our eyes a vista most pleasant to behold. The work of the Experimental Union will never be finished. Men and events shall come and go, but it shall stay and grow and increase, until through time we hope to see it the unbreakable chain, binding together farmers and farmers' interests, holding for right and equity, setting the standard for research and experiment, and representing all that is noble and good in progressive Canadian Agriculture.

W. L. Smith, Editor Farmers' Sun, Toronto: The work of the Experimental Union is of more importance than that carried on by the Provincial Winter Fair at Guelph, important as the latter undoubtedly is. Crop production is at the basis of everything in agriculture. Without crop production, triumphs such as those won by John Campbell and James Leask in the live stock ring at the Chicago International Show would have been impossible. That the work of this Union is appreciated, is shown by the fact that the number taking part in it has increased from twelve, twenty years ago, to nearly 8,000 to-day. It is shown also in the interest taken in the reports of the co-operative experimental work as presented, by thousands who are not members of the Union.

The suggestion made by the president that the province be divided into districts, and the results of experiments, in each district, be published separately, is a good one. Something along this line has already been done in the details given by Prof. Zavitz in his annual address. A formal division would, however, be better, because conditions in different localities vary so much.

The point in the president's address which should have had the most serious consideration, is that dealing with co-operation. That is the principal question before the farmers of Ontario to-day. The day of the individual is past and gone for ever. We shall either have a system of co-operation under which farmers will divide among themselves, their full share of the profits coming from their toil, or tillers of the soil will be in the position of servants to great corporations.

I was pleased, too, in hearing what the president said, in regard to securing increased influence for farmers in the shape of legislation. Farmers cannot have the influence in this respect they should have so long as the present condition continues, under which we have twenty-five farmers in the House of Commons, while the total number of representatives is upwards of two hundred. I do not agree, however, with the president, in saying that this Union will be found the most effective means of making the farmer's

influence felt in that respect. This Union exists for the purpose of assisting in educational work in regard to production and marketing. But there is another organization, through which farmers can make their influence felt in public affairs; that is the Grange, and I would like very much to see Mr. McCallum, and the young men here present, active members of that organization. By allying themselves with the Grange, they can become a power for good in assisting to give farmers what they have not now—their fair share in the control of public affairs.

Mr. A. E. Sherrington: I can say with pleasure that I am very much in sympathy with the work. No farmer of the province of Ontario can place a proper estimate on the work that is being carried on by this Experimental Union. The reports of this Union are very valuable. I think the work might be increased somewhat in value by having five or six farmers in a neighborhood conduct the same experiment. I have made experiments in my own neighborhood, and have been as careful as I possibly could, but it is only one farmer and one experiment, and if we had five or six, then I think we would get results of even more value. I do not think we can do too much to forward the work of this Experimental Union. I do not think the farmer can do too much in the way of conducting these experiments. It teaches the farmer to be more careful in every transaction on the farm; it teaches him to be more reliable in making notes on the various changes in crops and to be more careful to note what takes place on the farm in every way. I am more interested in fruits than in anything else, and I can go within five miles of my own home and find the same fruits growing differently, although under the same treatment, and same cultivation, and therefore, I think, valuable work can be done by dividing the province into districts. I would suggest that every farmer, if possible, should accept one of these experiments, and conduct it on his own farm. By doing so, he will become a better and a more useful farmer, and a better citizen.

RESULTS OF CO-OPERATIVE EXPERIMENTS IN AGRICULTURE.

By Prof. C. A. Zavitz, Agricultural College, Guelph.

This has been rather an unfavorable year for most kinds of farm crops throughout Ontario, owing to the unusually cold and backward spring and to the small amount of rainfall in some of the sections of the province. In spite of these drawbacks, however, the committee on agricultural experiments is pleased to state that it is in a position to present a valuable report of good work accomplished during the past year. In 1907, there were upwards of 4,000 experimenters in agriculture, and a keen interest was shown in the work throughout. The tests with grains, potatoes, sweet corn, roots, and fertilizers have been on the whole very satisfactory and valuable, but those with fodder corn, sorghum, and rape have furnished but little information which is of much practical use. The results of experiments in a poor year are sometimes more valuable than those in a year when all kinds of crops produce abundantly. We are greatly pleased with the character of the work of a large number of our experimenters. They deserve great credit for successfully conducting the various experiments, and farmers owe much to these experimenters for the valuable reports which they furnished and which are here presented in a summary form.

During the past year we have had experimenters in every county and probably in every township of the province. We are pleased to note the

fact that the farmers in the newer districts of the province are taking a very deep interest in this work. We are very glad indeed that this is the case, as it is important that the farmers in the newer portions of Ontario become familiar with improved methods of agriculture and secure at the very beginning of their operations the most promising varieties of farm crops.

For the benefit of those who are not familiar with our system of co-operation, it may be well to state that it is to a large extent the outgrowth of the experimental work done at the College, and that it is principally based on the results of that work. The experimental work in field agriculture was started at the College in 1876, and since that time it has gradually developed along various lines, until at present about two thousand plots are used annually in growing grains, fodder crops, grasses, clovers, roots, and potatoes; in testing manures and fertilizers, etc., with the object of obtaining information regarding the best varieties; the most productive selections of seed; the best time to sow the various classes of crops; the most improved methods of cultivation; the best mixtures of seed for the production of grain, hay, and pasture; the best methods of maintaining and increasing soil fertility, etc. Since the beginning of this work, over two thousand varieties of farm crops have been tested, and the best among these are now used for distribution in connection with the co-operative work of the Experimental Union.

In the spring of each year, circulars on the co-operative work are distributed by the agricultural committee appointed by the Union. These circulars give a list of all the experiments for which material can be furnished. They are sent by mail to the members of the Experimental Union; to the experimenters of former years who have done satisfactory work; to leading farmers whose names have been suggested by secretaries of Farmers' Institutes, secretaries of Agricultural Societies, principals of Collegiate Institutes, and inspectors of Public Schools. They are also sent to all persons asking for information regarding the co-operative work; and to all the newspapers of the province. In this way the work is brought to the notice of a very large proportion of the farmers of Ontario. The following gives the list of the co-operative experiments in agriculture, conducted throughout Ontario in 1907.

Co-operative Experiments in Agriculture in 1907.

Grain Crops.

	Plots
1 —Testing three varieties of Oats	3
2*a*—Testing three varieties of six-rowed Barley	3
2*b*—Testing two varieties of two-rowed Barley	2
3 —Testing two varieties of Hulless Barley	2
4 —Testing two varieties of Spring Wheat	2
5 —Testing two varieties of Buckwheat	2
6 —Testing two varieties of Field Peas	2
7 —Testing Emmer and Spelt	2
8 —Testing two varieties of Soy, Soja, or Japanese Beans	2
9 —Testing three varieties of Husking Corn	3

Root Crops.

10 —Testing three varieties of Mangels	3
11 —Testing two varieties of Sugar Beets for feeding purposes	2
12 —Testing three varieties of Swedish Turnips	3
13 —Testing Kohl Rabi and two varieties of Fall Turnips	3
14 —Testing Parsnips and two varieties of Carrots	3

Forage, Fodder, Silage and Hay Crops.

15 —Testing three varieties of Fodder or Silage Corn 3
16 —Testing three varieties of Millet 3
17 —Testing three varieties of Sorghum 3
18 —Testing Grass Peas and two varieties of Vetches 3
19 —Testing Field Cabbage and two varieties of Rape 3
20 —Testing three varieties of Clover 3
21 —Testing Sainfoin, Lucerne and Burnet 3
22 —Testing five varieties of Grasses 5

Culinary Crops.

23 —Testing three varieties of Field Beans 3
24 —Testing three varieties of Sweet Corn.

Fertilizer Experiments.

25 —Testing fertilizers with Potatoes 8
26 —Testing fertilizers with Swedish Turnips 6

Miscellaneous Experiments.

27 —Sowing Mangels on the level, and in drills 2
28*a*—Testing two varieties of Early Potatoes 2
28*b*—Testing two varieties of medium ripening Potatoes 2
28*c*—Testing two varieties of Late Potatoes 2
29 —Testing three grain mixtures for grain production 3
30 —Testing three mixtures of Grasses and Clover, for hay 3

Autumn Sown Crops.

31 —Testing Hairy Vetches and Winter Rye as fodder crops 2
32 —Testing three leading varieties of Winter Wheat 3
33 —Testing five Fertilizers with Winter Wheat 6
34 —Testing Autumn and Spring Applications of Nitrate of Soda and Common Salt with Winter Wheat 5
35 —Testing two varieties of Winter Rye for grain production 2

Most of the plots were one rod wide by two rods long, being exactly one-eightieth of an acre in size. In former years some plots consisted of one-tenth acre and a few of one-half acre in size, but for most experiments these were found less satisfactory than the small plots.

For the following summary, only the results given in the most reliable reports were used. Many of these reports have been sent in by men who have had a large amount of practical experience on the farm, have had the advantages of a good education, and by means of conducting experiments in former years have become quite expert in the work. It should be remembered, however, that while only the good reports of carefully conducted experiments have been used for publication, many of those not included in the summary show that the individual experimenters must have obtained a considerable amount of value from the work. It frequently happens that, owing to some unavoidable accident, the experiment may be to some extent injured so that the results cannot be used in the general summary, and yet the experiment may have furnished useful lessons to the farmer conducting it. In all cases experimenters obtain much more information from the work which they have carried on than can be given in a tabulated report.

The average results of the successful co-operative experiments with grain crops are presented in the following table:—

Grain Crops.

Experiments.	Varieties.	Comparative value.	Yield per acre. Straw (tons.)	Grain (lbs.)	Grain (bus.)
Oats (102 tests)	Imported No. 534	100	1.19	1,273	37.44
	Daubeney	86	1.15	1,154	33.95
	Improved Ligowa	91	1.18	1,154	33.95
Six-rowed Barley (42 tests.)	No. 21	100	1.03	1,487	30.98
	Mandscheuri	94	1.03	1,471	30.65
	Oderbrucker	61	1.04	1,306	27.20
Two-rowed Barley (3 tests.)	French Chevalier	100	1.60	1,146	23.88
	Two-rowed Canadian	50	1.52	860	17.92
Hulless Barley (6 tests.)	Black Hulless	100	.83	1,135	18.92
	Guy Mayle	100	.75	1,054	17.56
Spring Wheat (13 tests.)	Wild Goose	100	1.35	1,203	20.05
	Red Fife	92	1.64	1,145	19.08
Emmer and Spelt (5 tests.)	Common Emmer	100	1.51	1,768	44.20
	Red Spelt	63	1.17	952	23.80
Winter Wheat (8 tests.	Imperial Amber	100	1.30	1,330	22.17
	Abundance	88	1.27	1,302	21.71
	Michigan Amber	88	1.21	1,215	20.25
Winter Rye (2 tests.)	Mammoth	100	1.08	1,480	26.43
	Common	50	1.02	1,200	21.43
Field Peas (42 tests.)	Early Britain	92	1.12	1,832	30.53
	New Canadian Beauty	100	1.28	1,572	26.20
Field Beans (12 tests.)	New Prize Winner	91	.61	1,235	20.59
	White Wonder	100	.60	1,220	20.33
	Marrowfat	70	.65	1,122	18.69
			Whole crop.		
Corn for Grain (12 tests.)	Genesee Valley	100	7.69	1,860	33.21
	King Philip	79	6.89	1,626	29.04
	Compton's Early	96	9.57	1,146	20.47
			Straw.		
Mixtures (4 tests.)	Daubeney Oats.....34 lbs. per acre Mandscheuri Barley48 " " " Siberian Oats.....25 " " "	100	1 37	1,340	
	Chevalier Barley...35 " " " Goose Wheat.....22 " " "	73	1.51	980	
	Siberian Oats.....34 " " " Chevalier Barley...48 " " "	64	1.27	940	

The first column of figures in this table represents the comparative value of the varieties, as estimated by the experimenters themselves. In making this comparison, all the characteristics of the varieties were taken into consideration. The yield of straw, as given in the second column, represents the total crop less the amount of grain, and therefore includes the chaff with the straw. The yield of grain is given in pounds and also in bushels per acre, in order that the results may be more clearly understood, and that comparisons may be made between the different classes of crops as well as between the varieties of each class. Owing to the great variation in the weight per

measured bushel of the different crops, it is easier to compare the results in pounds than in bushels per acre.

Oats. Three varieties of oats were distributed in the spring of 1907, and one hundred and two reports of successfully conducted experiments were received. Of the three varieties distributed, the Imported No. 534 and the Improved Ligowa had given good satisfaction as general croppers in connection with the experimental work at the College. The Daubeney is a very early variety and is becoming popular among Ontario farmers where an early oat is desirable, to be grown either by itself or with a medium ripening variety of barley, such as the Mandscheuri. It will be seen from the tabulated results that the Imported No. 534 occupies highest place in comparative value and in yield of both grain and straw per acre. The Improved Ligowa is grown considerably in Ontario. It possesses a comparatively stiff straw, but is rather subject to the attacks of rust. The Imported No. 534 was reported by the experimenters as being comparatively stiff in the straw and very free from rust. The Siberian oats surpassed the Imported No. 534 in 1906 in both popularity and in productiveness. This variety, however, has now become so well known throughout Ontario that it was not included amongst the co-operative varieties for 1907.

Six-rowed Barley. Barley No. 21 was originated at our Agricultural College from one plant which was selected in 1903 from upwards of nine thousand plants of the Mandscheuri variety, produced from seeds which were planted by hand at a uniform distance apart. In the co-operative experiments over Ontario in 1907, this barley slightly surpassed the Mandscheuri variety in yield of grain per acre, strength of straw, freedom from rust, early maturity, and in general popularity, although the differences were only slight throughout. In 1906, the Mandscheuri barley gave a little better yield than No. 21, but the latter surpassed the former in general popularity when strength of straw and other characteristics were taken into consideration. It is also interesting to know that No. 21 gave the highest yield per acre of all barleys grown at the College in 1907. It will be remembered that the Mandscheuri barley was introduced by our College and distributed throughout Ontario through the medium of the Experimental Union. By replies received this year from Ontario farmers, we learn that about 74 per cent. of the barley now grown in Ontario is of the Mandscheuri variety. The introduction of this barley has undoubtedly had considerable influence in increasing the average yield of barley per acre per annum throughout Ontario about 24 per cent. for the last ten years, as compared with that for the ten years previous. The Oderbrucker variety was introduced from Germany and has been one of the closest rivals of the Mandscheuri.

Two-rowed Barley. The interest taken in two-rowed barley throughout Ontario is not great, as may be seen from the fact that we have fourteen times as many good reports from six-rowed as we have from the two-rowed varieties in 1907. It will be seen from the tabulated results that the highest yielding variety of two-rowed barley gave an average yield of about three and one-half bushels per acre less than the lowest yielding six-rowed barley. At the Agricultural College, the Canadian Two-rowed gave very good results indeed for a number of years previous to 1907. It was distributed throughout Ontario in 1906 for the first time, and in that year gave a greater yield and was more popular throughout the Province than the French Chevalier. The peculiar weather conditions of the past season, however, appear to be very unfavorable for the proper growth of the Two-rowed Canadian variety.

Hulless Barley. Hulless barley has been grown to a considerable extent in some parts of Ontario in recent years. Upwards of a dozen varieties have been under experiment at the College. The Black Hulless is the oldest and

best known variety in Ontario. In recent years, however, it has been surpassed in yield per acre, both at the College and throughout Ontario, by the Guy Mayle variety. In 1907, however, the Black Hulless has given a slight increase in yield over the Guy Mayle, according to the reports of the experimenters. In spite of this, however, the Guy Mayle and the Black Hulless varieties were placed equal in the comparative results, when all points were taken into consideration.

Spring Wheat. The two varieties of spring wheat, distributed in the spring of 1907, represent two classes of grain. The Wild Goose is a durum wheat and is specially suitable for the production of macaroni, and the Red Fife is one of the finer grained wheats which produces flour of excellent quality. In the experiments at the College, the Wild Goose variety usually yields considerably more than the Red Fife. This generally holds true throughout Ontario in connection with the co-operative experiments. In 1907, however, the difference is not very marked, there being about an average of one bushel of grain per acre in favor of the Wild Goose variety. According to the reports of experimenters, the Wild Goose wheat is grown more extensively throughout Ontario than any other variety.

Emmer and Spelt. These represent two classes of wheat which are being studied more particularly for the production of feed for farm stock than for the production of flour. When threshed, there is not a separation of the grain and the chaff, but both are ground together into meal as feed for farm stock. The Emmer usually has about 22 per cent. of hull or chaff, and the Spelt about 30 per cent. It will therefore be seen that the amount of hull on the Emmer is considerably less than that of an average variety of oats. As was expected, the results of the co-operative experiments show that the Emmer has given a decidedly larger yield of grain per acre than the Spelt. It will be noticed from the chart that the Common Emmer gave a greater average yield of grain per acre in 1907 than that produced by the best varieties of oats, barley, wheat, or rye, but not quite equal to those of corn and peas.

Winter Wheat. A report, giving the results of experiments conducted with winter wheat and winter rye, both at the College and throughout Ontario, was sent to each of the agricultural experimenters throughout Ontario for 1907 and also to about three hundred and fifty of the newspapers of the Province. The Imperial Amber, which gave the greatest yield of grain per acre during the past year, is a close rival of the Dawson's Golden Chaff variety. The grain of the Imperial Amber, however, is of better quality than that of the Dawson's Golden Chaff for flour production. According to the reports received from the experimenters, the Imperial Amber proved to be very hardy, and possessed the longest and cleanest straw and the plumpest grain of the varieties included in the co-operative tests.

Winter Rye. Of the two varieties distributed in the autumn of 1906, the Mammoth surpassed the common variety in both height of plants and in popularity, amongst the experimenters.

Field Peas. For the three years previous to 1906, we sent peas only to those districts where the pea weevil had not been found troublesome. As the ravages of this pest were becoming decidedly less manifest, and as many farmers were beginning to increase the acreage of this crop, it was decided to send peas for experimental purposes to all parts of the Province from which applications were received. On averaging the results of the forty-two first-class reports which came to hand in 1907, we find that the Early Britain stands first in yield of grain with 30.5 bushels per acre, and the New Canadian Beauty, second, with 26.2 bushels. Notwithstanding the fact that the Early Britain gave an average of fully four bushels per acre more than the New

Canadian Beauty, the last named variety was placed first in the comparative value in the estimation of the experimenters. This was undoubtedly due to the fact that the grain of the Early Britain variety is of a brownish color and is somewhat shrunken in form, while that of the Canadian Beauty is large, smooth and white, and is hence a much better pea for market purposes than the first named variety. It will be noticed that the Early Britain gave a very high yield of grain per acre, being surpassed by no other grain crop in 1907 except by the Genesee Valley variety of corn, which surpassed the Early Britain peas by only 28 pounds of grain.

Field Beans. The Prize Winner variety of field beans, which has given very excellent results in the work at the College, stands the highest in yield of grain per acre of the three varieties of field beans tested over Ontario in 1907. This variety, however, was closely followed by the White Wonder, which has also made a high record at Guelph. Both of these varieties produce small white beans of excellent quality.

Corn for Grain. It will be noticed that the greatest yield of grain produced in connection with the co-operative experiments in 1907, was obtained from the Genesee Valley variety of field corn. This variety was distributed throughout Ontario in 1907 for the first time. In the average of six years' experiments at the College previous to 1907, the Genesee Valley gave an average of slightly over 60 bushels of shelled grain per acre, being one of the very highest yielders amongst the varieties tested. The Genesee Valley is a very early variety of eight-rowed yellow flint corn. The King Phillip, which stands second in yield per acre over Ontario in 1907, has also produced a very high yield in the experiments at the College. It is also an early eight-rowed flint corn, but the grain is nearly red in color. The Compton's Early is a twelve-rowed yellow flint corn, quite well known in many parts of Ontario, as it is grown more extensively than either of the other varieties in the experiment.

Mixtures for Grain Production. As a result of conducting extensive experiments with a large number of mixtures of grain for the production of grain for feeding purposes at the College, it has been found that a mixture of barley and oats has given a larger yield of grain than any other combination, and a larger yield even than any kind of grain grown separately. We have also learned that one bushel per acre of each is about the right quantity to sow, in order to produce the largest possible crop. In addition to this, we have found that certain varieties of barley and oats can be grown together to good advantage, because they mature at about the same time. In each of the past three years, we have distributed three mixtures for co-operative experiments, the first consisting of Daubeney oats and Mandscheuri barley, to be sown at the rate of one bushel of each per acre; the second, a mixture of Siberian oats and Chevalier barley, to be sown at the same rate; and the third, a mixture of Siberian oats, Chevalier barley, and Wild Goose spring wheat, to be sown at the rate of twenty-five pounds, thirty-five pounds, and twenty-two pounds per acre respectively. In each year the early mixture, consisting of Daubeney oats and Mandscheuri barley, gave the highest yield and stood first in the estimation of the experimenters for use on their farms. In the results for 1907 it will be observed that this mixture gave upwards of three hundred pounds more than either of the other mixtures.

Mangels. The three varieties of mangels, used in the co-operative experiments of 1907, represent three distinct types, viz., the long, the intermediate and the globe. A few years ago the long red mangel was grown much more extensively throughout Ontario than either the intermediate or the globe types. From inquiries made in 1907, however, we ascertained that the intermediate type is now grown about as extensively as the long red class. There

are a large number of varieties of each of these classes, and according to our results at Guelph we find a considerable difference in the productiveness of the different varieties of each class. In the average results of twenty varieties of mangels of all classes grown at the College for five years in succession, we have obtained the greatest yield of roots per acre from Ferry's Yellow Leviathan. This is an intermediate yellow mangel and has given a greater yield per acre than all of the long red, as well as all of the other intermediate varieties. In each of four years in succession the Yellow Leviathan has given the greatest yield of roots per acre of the different varieties used in the co-operative experiments throughout Ontario. In 1907 it gave two tons per acre more than the Sutton's Mammoth Long Red, and nearly three tons per acre more than the Carter's Windsor Yellow Globe in the average of ten experiments. It was decidedly the most popular variety of mangel distributed, not only in 1907 but also in each of the three years previous.

FIELD ROOTS AND FODDER CROPS.

Experiments.	Varieties.	Comparative value.	Yield per acre.
			tons.
Mangels (10 tests).....	Ferry's Yellow Leviathan..	100	36.77
	Sutton's Mammoth Long Red	70	34.71
	Carter's Windsor Yellow Globe	65	34.05
Sugar Beets (8 tests)...	Bruce's Giant White Feeding	100	25.43
	Rennie's Tankard Cream	63	22.39
Swede Turnips (4 tests)	Carter's Invicta	100	32.18
	Sutton's Magnum Bonum	88	31.53
	Rennie's Queen	38	27.66
Fall Turnips and Kohl Rabi (3 tests)	Red Top White Globe Fall Turnip	100	29.55
	White Egg Fall Turnip	67	22.12
	Early White Vienna Kohl Rabi	44	12.44
Carrots and Parsnips.. (2 tests).	Bruce's Mammoth Inter. Smooth White Carrot	100	20.60
	Steele's Improved Short White Carrot	100	20.54
	Buckbee's New Sugar Parsnip	40	10.92
Millet (3 tests).....	Japanese Common	86	10.44
	Japanese Panicle	100	10.10
	Hungarian	71	9.31
Grass Peas and Vetches (1 test.)	Hairy Vetches	100	9.20
	Grass Peas	90	8.80
	Common Vetches	55	6.00

Sugar Beets for Feeding Purposes. The Giant White Feeding variety of sugar beets was compared with the Royal Giant in 1905 and again in 1906, and with the Tankard Cream in 1907. In each of these years, the Giant White Feeding variety gave the greatest yield of roots per acre and was the most popular in the estimation of the experimenters. According to the chemical analysis at the College the Giant White Feeding contained 7.8 per cent. sugar in the average of six years, and the Tankard Cream, 8.9 per cent. in the average results for five years. It will therefore be seen that the Tankard Cream has about one per cent. more sugar than the Giant White Feeding variety.

Swede Turnips. The Carter's Invicta and the Rennie's Queen varieties of swede turnips were used in connection with the co-operative experiments in 1907 for the first time. The Carter's Invicta had given particularly good results at Guelph. It seems specially suitable as a turnip, not only for the production of roots for feeding purposes, but also of roots for shipping to the American markets for table use. It has been selected as one of the choice varieties for this purpose amongst all the varieties tested at the College. In the co-operative experiments for 1907, the Carter's Invicta surpassed the Sutton's Magnum Bonum variety, which headed the list in each of the three years previous. This new variety, therefore, is making a high record for itself.

Fall Turnips and Kohl Rabi. Fall turnips are grown only to a limited extent throughout Ontario. As a rule, they do not keep long into the winter, and hence must be fed mostly in the autumn. The yields per acre of the fall turnips are sometimes higher than those of the Swedish varieties. In 1907, however, the yield of the fall turnips was rather lower than those of the Swedes. The Red Top White Globe occupied the highest place in yield per acre in 1904 and in 1905, as well as in the present year. In 1906, no good reports of experiments with fall turnips were received. The Kohl Rabi, which is grown to a certain extent in the Old Country as a feed for sheep and other kinds of farm stock, does not yield nearly as well in Ontario as our principal classes of roots now grown in the Province.

Carrots and Parsnips. It has been the rule for the past few years to send out one variety of parsnips along with two of carrots, in order that farmers may see for themselves the comparative yielding powers of these two classes of roots. The Mammoth White Intermediate carrot has been the leader in the tests for the past three years and is also one of the very best varieties grown at the College. The parsnip has given a decidedly lower yield than either of the varieties of carrots in each of the past four years.

Fodder Corn. Three varieties of fodder corn were distributed in the spring of 1907, viz., Henderson's Eureka, White Cap Yellow Dent, and Reid's Yellow Dent. Owing to the peculiar weather conditions, however, we have no satisfactory report to offer. These varieties have been carefully tested at Guelph, and the White Cap Yellow Dent especially has given particularly good results. This variety is now being grown considerably in the central and the north-western parts of the Province.

Millet. Owing to the peculiar weather conditions of the past summer, the millets did not give specially large results in the co-operative experiments, and we have a summary of only three successfully conducted tests to report. It will be noticed that the Hungarian Grass, the best known variety throughout Ontario, occupies the lowest place in yield of green crop per acre. This was also the case in 1905 and again in 1906. The Japanese Panicle, although a little the lowest yielder in the past year of the two Japanese millets, was the most popular with the experimenters. This is a variety of millet that has given excellent results at the College. When ordering this variety, farmers should be careful that they receive seed almost black in color, smooth, and very shiny. Several seedsmen, in advertising Japanese millet, illustrate the Japanese Panicle variety but describe the Japanese Barnyard millet. Some seedsmen have corrected this mistake, but others have not.

Sorghum. A considerable number of sorghums, including different varieties of sugar cane, broom corn, Kaffir corn, millo maize, Jerusalem corn, etc., have been grown at the College for several years in succession. Some of these, and especially the sugar canes, have given fairly good satisfaction. In some localities throughout Ontario sugar cane has been grown with a considerable amount of satisfaction as a fodder crop. The yield is almost as

good as our leading varieties of corn, and the crop, which contains a large amount of sugar, is greatly relished by farm stock and fed either in the green or in the dry condition. As yet there is not a very great demand for sorghum seed in connection with the co-operative work. Although a few co-operative experiments were conducted in 1907, no reports have been received which can be used in the summary.

Grass Peas and Vetches. For the past few years Grass peas and two varieties of vetches have been used in the co-operative work. On examining the accompanying table it will be found that the Hairy vetches not only gave the greatest yield per acre, but were also more popular than either of the other varieties. The seed of this crop, however, is very expensive, frequently costing five to six dollars per bushel. It is therefore not likely that this variety will be grown to any great extent throughout Ontario.

Rape. The number of applications for the experiment with rape is quite limited, and owing to the peculiar weather conditions of the past summer, no good reports have been received which can be placed in a tabulated form.

Clovers. Three varieties of clovers, viz., Common Red, Alsike, and Mammoth Red are distributed for co-operative experiments each year. The experiments with these crops are chiefly valuable to the individuals conducting them. As the Common Red usually produces two crops in the one year and each of the others one crop per season, and as the Common Red is not apt to survive the second winter as well as the Mammoth variety, it is difficult to get accurate results which will form a good summary report. We believe, however, that this experiment is valuable in the excellent object lessons which it furnishes.

Perennial Crops. Another experiment which is of value chiefly to the individual experimenters and to others who are enabled to see the experiment, is one with Lucerne, Sainfoin and Burnet. In general, it may be said that the Lucerne is giving good satisfaction in many parts of Ontario. If sown on well drained soil it usually produces three or four good crops each year, and the fodder or hay made from it is of high feeding value when properly handled. The Lucerne is very profitable, grown as a soiling crop, since it gives a continuation of green fodder throughout the season. The Sainfoin is not proving so satisfactory for general cultivation as the Lucerne. The Burnet is a very hardy plant and is one of the best in furnishing pasture, when many other kinds of crops produce but little growth in the hot, dry period in the summer.

Grasses. A number of fairly good reports of experiments with grasses have been received. It is difficult, however, to present the results in tabulated form. The varieties which have been distributed during the last few years are the following: Tall Oat, Timothy, Orchard Grass, Awnless Brome, Tall Fescue, Western Rye and Lyme Grass. The Tall Oat grass has given the greatest yield of hay per acre in the average results of all the reports received during the last three or four years. The Western Rye grass stood the highest in yield of hay for 1907, the yield being about three and one-half tons of hay per acre.

Method of Sowing Mangel Seed.

Experiments have been conducted at the College for a number of years past to determine whether it was better to sow the seeds of root crops in drills or on the level ground. In the majority of cases it was found that a larger crop of roots was produced when the seeds were sown on the level. It was decided, therefore, in the spring of 1906, to include an experiment of this kind as one of the co-operative tests for that year. The experiment was again repeated in 1907. In these years, mangel seed was distributed to a

number of applicants. The results so far have not been sufficient to present in summary form, but the indications are rather in favor of level cultivation. This experiment will likely be repeated in the future, and we hope to get fuller reports of carefully conducted experiments.

Sweet Corn for Home Use.

Sweet corn for table use is greatly relished by a large number of people both in the city and in the country. There are now a very large number of varieties, some being early and others late, some producing large ears and others small, and some being very tender and juicy while others are of rather inferior quality. Upwards of fifty varieties of sweet corn have been tested at the College for productiveness and for table quality. During the past few years a few of the choice varieties have been selected for co-operative experimental work. In the spring of 1907, three varieties were distributed for testing throughout Ontario. The following table presents some of the averages of the principal results of these experiments:

Experiment.	Varieties.	Comparative value.	Table quality.	Number of ears per plot.	Number of days until ready for table use.
Sweet corn (20 tests)....	Ringleader.....	87	74	119	96
	Golden Bantam.....	100	100	114	97
	Mammoth White Cory.....	84	64	102	104

The Ringleader variety of sweet corn is very early and produces a large amount of ears. The ears are quite small but are of good quality. The Golden Bantam is ready to use at about the same time as the Ringleader. Of all the varieties of sweet corn grown at the College, the Golden Bantam has given the best satisfaction for table use. The ears are rather small, yellow in color, and possess eight rows. The corn is exceedingly tender and possesses an excellent flavor. In the co-operative experiments over Ontario in 1907, the Golden Bantam corn was reported by the experimenters as possessing the best table quality and as being the choice of the varieties tested for home use. During the three years in which the Golden Bantam variety has been tested, it has occupied decidedly the highest place each year for table quality. The Mammoth White Cory, which is the best known variety throughout Ontario, was inferior to the Golden Bantam in nearly every respect.

Varieties of Potatoes.

By inquiries made through the Experimental Union during the past season as to the varieties of potatoes most extensively grown in the different counties throughout Ontario, we received the names of sixty-four different kinds. The majority of these, however, were not mentioned in more than one or two counties. It was rather pleasing to learn that the three varieties most largely grown throughout the Province, were each distributed quite extensively through the medium of the Experimental Union as far back as 1896. Those varieties which appear to be mostly grown in Ontario at

the present time are the following:—Rural New Yorker No. 2, Empire State, American Wonder, Early Ohio, Early Rose, Beauty of Hebron, Carman's No. 1 and No. 3, and White Elephant.

In the spring of 1907, the Experimental Union distributed three varieties of late, three varieties of medium, and seven varieties of early potatoes for co-operative experiments. Only two varieties were sent to each experimenter, but as the same varieties were sent to each experimenter with each class of potatoes, a basis was formed for summarizing the results given in the reports. A very large number of applications were received and upwards of four hundred first-class reports were sent to us this autumn, and have been embodied in the summary presented in the following table:

Experiments.	Potatoes.	Comparative value.	Per cent of small tubers.	Mealiness when cooked.	Bushels of whole crop per acre.
Late varieties (89 tests)..	Empire State	100	7	100	157.78
	Gold Coin	74	7	90	144.73
	Carman No. 1	68	8	84	118 72
Medium varieties (108 tests)	Burpee's Extra Early	100	8	100	151.18
	Rose of the North	78	11	81	147.14
	Early Hero	67	11	78	136.20
Early varieties (217 tests)	Extra Early Eureka	96	15	79	149.58
	Early Harvest	97	12	100	149.36
	Early Fortune	100	13	93	143.94
	Early Andes	100	10	88	129.64
	Early Dawn	87	12	93	117.12
	Early Pinkeye	58	22	67	95.22
	Stray Beauty	57	29	63	66.79

The results in the foregoing table are exceedingly interesting. Of the late varieties, the Empire State has been included in the co-operative experiments for a number of years, but the Vermont Gold Coin and the Carman No. 1 were distributed in the spring of 1907 for the first time. The Empire State variety, which is probably grown more extensively throughout Ontario at the present time than any other variety with the exception of the Rural New Yorker No. 2, is a very excellent potato. In the average results of all the experiments with varieties of potatoes conducted throughout Ontario in 1907, the Empire State gave the highest yield per acre. The percentage of small tubers was very small, and the quality of the potatoes was excellent. The comparative value given by the experimenters was 100 for Empire State, as compared with 74 for Vermont Gold Coin, and 68 for the Carman No. 1.

Among the three medium varieties distributed in 1907, the Burpee's Extra Early gave the best results in yield per acre, size of tubers, quality of potatoes, and general popularity. The Early Hero, which was distributed this year for the first time, gave comparatively low results.

Upwards of two hundred good reports of early potatoes were received. The Early Eureka and the Early Harvest were distributed in 1907 for the first time. The Early Fortune, however, has been distributed on several occasions and has always given good results in former years. Although it was

slightly surpassed in yield in 1907, it will be noticed that it was even this year more popular with the experimenters than either the Early Eureka or the Early Harvest varieties. The Early Pinkeye and the Stray Beauty gave exceedingly low results. Although the weather conditions of the past season have been rather unusual in many parts of the province, the season has been a very good one for the testing of varieties of potatoes. Only the strong varieties gave satisfactory returns during the past summer. All who are interested in the growing of potatoes should study carefully the results here presented.

Fertilizers with Farm Crops.

As considerable co-operative work has been done along the line of testing a number of fertilizers with various classes of farm crops, a table is here presented which gives a summary of the results of all the experiments conducted within the past fifteen years, including the tests of fertilizers with winter wheat in 1907 for the fourth time, and those with potatoes for the first year.

Kind of fertilizer used.	Fertilizer per acre.		Average yield per acre.						
			Oats	Winter wheat	Fodder Corn.		Mangels.	Swede turnips.	Potatoes.
					Total	Ears			
	Weight	Cost	5 years 74 tests	4 years 9 tests	8 years 47 tests	8 years 41 tests	5 years 41 tests	4 years 12 tests	1 year 22 tests
	lbs.	$	bus.	bus.	tons.	tons.	tons.	tons.	bus.
Nothing	.....	.....	38.9	18.7	8.2	2.7	20.6	21.9	107.2
Nitrate of soda	160	4 80	46.3	22.5	9.4	3.1	26.5	24.1	138.6
Muriate of potash	160	4 00	43.8	21.2	9.4	3.0	24.6	24.9	144.3
Superphosphate	320	3 92	43.6	21.1	9.0	3.1	24.2	25.9	146.3
Complete fertilizer	213	4 24	48.7	23.7	9.4	3.2	25.4	27.2	152.9
Potato fertilizer	320	5 52	.....	.....	.....	.....	.....	.....	149.1
Royal Canadian	320	5 60	.....	.....	.....	.....	.....	.....	149.0
Cow manure	40,000	6 00	.....	25.4	.....	.....	.....	30.1	158.8

In each of the years, both the fertilizers and the seeds have been sent from the College to the experimenters. In every instance, the nitrate of soda and the muriate of potash have been applied at the rate of 160 pounds per acre, and the superphosphate at the rate of 320 per acre. The mixture or complete fertilizer has been composed of one-third the amount of these fertilizers, making in all 213⅓ pounds. Both the Royal Canadian and the potato fertilizer used in 1907 with the potato crop, were applied at the rate of 320 pounds each per acre. In all cases, the nitrate of soda has been applied when the plants were about three inches in height, and all the other fertilizers at the time of sowing the seed. Farmyard manure has been used in the experiments of the past six years. The advice of each experimenter has been to apply 500 pounds of average cow manure per plot, the application being equal to twenty tons per acre. The cow manure has been mixed with the soil to a depth of from four to five inches, and the fertilizers have been stirred in the soil to a depth of from one to two inches.

In connection with the co-operative work, experiments have been conducted throughout Ontario with fertilizers on oats for five years,

winter wheat for four years, fodder corn for eight years, mangels for five years, swede turnips for four years, and potatoes for one year. The reports for 1907 are confined to the experiments with fertilizers with winter wheat, and with potatoes.

The price of commercial fertilizers varies somewhat from year to year. The writer, therefore, corresponded with a number of the Canadian firms who sell fertilizers, asking them the prices at which they expected to sell their fertilizers for delivery next spring. The cost of each fertilizer, as given in the table, represents, therefore, the present cost per acre for the fertilizers as used in the co-operative experiments in 1907. The quotations were the factory prices for quantities of about one-half ton. The twenty tons of cow manure would mean about twelve good sized loads per acre, and manure in Guelph has been selling at 50 cents per load, which is probably about the average for the province. It is exceedingly difficult to place a price on farmyard manure, as in most cases it is not purchased but is produced on the farm. Each person may place such value on the manure as he deems expedient, and study the results according to his own circumstances. It should be remembered that the freight on the fertilizers and the application of both the fertilizers and the manure are not taken into consideration in the foregoing statement, nor yet is there any account made of the future influence of the different fertilizers and the manure upon the land.

Fertilizers with Oats.—Seventy-four good reports of successfully conducted experiments in applying fertilizers to oats were received during the five years in which this experiment was conducted over Ontario. The lowest yield was obtained from the unfertilized land, 38.9 bushels per acre; and the highest average yields from the mixed fertilizer, 48.7 bushels; and the nitrate of soda, 46.3 bushels per acre. The unfertilized land produced the lowest yield per acre in each of the five years. The mixed or complete fertilizer gave the largest yield of oats per acre in the average results of this experiment in each of the five years in which it was conducted. Although the land which received the mixed fertilizer gave an average of 9.8 bushels of oats per acre more than the unfertilized land, still this increase was produced at a cost of about 42 cents per bushel, according to the present prices of fertilizers. It will therefore be seen that it is only in special years that the commercial fertilizers will give economical results with oats on the average land of Ontario. The mixed fertilizer gave a larger average yield than no fertilizer on heavy soils by 12.7 bushels per acre, on light soils by 10.2 bushels per acre, and on black mucky soils by 7.1 bushels per acre.

Fertilizers with Winter Wheat.—In the co-operative experiments with different manures, applied in the spring of the year, the average yields of grain per acre for the past four years are presented in the accompanying table. It will be seen that the greatest average yields were produced from the application of cow manure and from the use of the mixed fertilizer. According to the prices of fertilizers given in the table, the most economical increase in the yield of winter wheat was made by the application of the mixed fertilizer, and even in this case the cost of the increased yield amounted to 85 cents per bushel. Every bushel of increase in yield, produced by the use of superphosphate, was obtained at a cost of $1.63.

Fertilizers with Corn.—In the average of experiments in applying fertilizers with corn in each of eight years, during which time forty-seven complete and satisfactory reports were received, it will be seen that the yields of whole crop produced by the plots which received an application of nitrate of soda, muriate of potash, and mixed fertilizer, were equal, while a plot

on which superphosphate was applied produced nearly half a ton less than the others, and that the largest yield of husked ears was obtained when the mixed fertilizer was applied to the land. The muriate of potash produced the corn at the least cost per ton, but even with this fertilizer it cost $3.33 on the average to produce each additional ton of fodder corn.

Fertilizers with Mangels.—During the five years in which fertilizers were used with mangels, forty-one good reports of successfully conducted experiments were received. These show that the smallest average yield was produced from the unfertilized plot; viz., 20.6 tons per acre, and that the largest average yield was produced from the nitrate of soda; viz., 26.5 tons per acre. As in the case with corn, the unfertilized land gave the lowest yield in each year. The nitrate of soda produced the highest yield in four out of five years. The average of 197 bushels of mangels per acre, produced by the nitrate of soda over the unfertilized land, was obtained at a cost of about 2.4 cents per bushel. The nitrate of soda produced the largest yield on both heavy and light soils, but on the black loams the muriate of potash gave the highest yield of mangels. The nitrate of soda showed the greatest influence upon the light soils, as in the average of fifteen experiments the sandy land which was fertilized at the rate of 160 pounds of nitrate of soda per acre gave an average yield of $7\frac{2}{3}$ tons per acre more than the land which was unfertilized.

Fertilizers with Swede Turnips.—On averaging the results given in all the reports of the test of fertilizers with swede turnips, we find that barnyard manure has been instrumental in producing the largest yield of roots, and that mixed fertilizer stands second in this respect. According to the prices given for the manure and the fertilizers in the foregoing table, the increased yield of turnips was produced at a cost of 73 cents per ton by the use of cow manure, and 80 cents per ton or 2.4 cents per bushel by the use of the mixed fertilizer.

Fertilizers with Potatoes.—Thirteen different kinds of fertilizers were used with potatoes at the Agricultural College for five years in succession. In these experiments, the Royal Canadian Fertilizer gave the highest, and what is known as the Potato Fertilizer, the second highest yield of tubers per acre. Another fertilizer experiment was then arranged, and after conducting it for five years in succession, it was found that the highest yield was obtained from a mixed fertilizer similar to the one used in connection with our co-operative work with other crops. This, however, was closely followed in yield by the Royal Canadian and by the Potato Fertilizer. The last two are both complete fertilizers, each containing nitrogen, phosphoric acid, and potash. The Royal Canadian Fertilizer is sold by the Capelton Chemical Co., Buckingham, Quebec, and the Potato Fertilizer by the W. A. Freeman Co., Hamilton, Ont.

In the spring of the present year both potatoes and fertilizers were distributed from the College throughout Ontario. From these experiments twenty-two good reports of successfully conducted tests were received, the average results of which are presented in the foregoing tabulated form. It will be seen that of the commercial fertilizers the mixture came first, while the Royal Canadian and Potato Fertilizer gave practically four tons per acre less. Each of these three fertilizers, however, gave upwards of 40 bushels per acre more than the unfertilized land. The highest yield of all was produced by an application of cow manure at the rate of 20 tons per acre. According to the prices given in the table, the cost of the increase in bushels of potatoes per acre was in each case as follows: mixed fertilizer, 9.3 cts.; superphosphate, 10 cts.; muriate of pot-

ash, 10.8 cts.; cow manure, 11.6 cts.; potato fertilizer, 13.2 cts.; Royal Canadian fertilizer, 13.4 cts.; and nitrate of soda, 15.3 cts. The majority of the experimenters tested the potatoes grown from all the fertilizers and reported the results for both flavor and mealiness. It was found, however, that the table quality was influenced but very slightly indeed by the fertilizers, there being only a variation of five per cent. in the average results, in reference to the table quality. The average results of the nine experiments, conducted on sandy soil, show that the potato fertilizer stands at the top of the list, and that this was followed quite closely by the cow manure and the muriate of potash. On the clay loam and heavy clay soils, however, the highest average yield was produced by the cow manure, and the second highest, by the Royal Canadian Fertilizer. A large amount of interest was shown in this experiment throughout the province, and it will likely be repeated in the future tests of the Experimental Union.

A MEMBER: For early sowing, is the Daubeney variety of oats a successful grower?

Prof. ZAVITZ: The Daubeney is a very good variety. It is exceedingly early, is white in the grain, thin in the hull, having about 24 per cent., and it is one of the very best varieties of very early oats in production of grain.

Mr. CREELMAN: Would the grain production make any difference if the crop is used for soiling purposes?

Prof. ZAVITZ: I think possibly it would, because the soiling crop is not generally used until it gets pretty nearly ripe, or at least until the grain is in the dough condition. I think oats with a greater amount of kernel when ripe would likely have a large amount of nourishment when cut for soiling purposes.

A MEMBER: Would it be one of the best oats to sow for early cropping?

Prof. ZAVITZ: It has proven itself to be one of the very best.

A MEMBER: How is its straw?

Prof. ZAVITZ: Fairly strong, and of a good length. Under similar conditions, it would stand up about the same as the American Banner.

Mr. HYATT: Did you make any experiments with sweet corn for canning purposes?

Prof. ZAVITZ: Yes, at the College, but not in the co-operative experiments.

Mr. HYATT: We feel the day is coming when these things are to be taken charge of by the Experimental Union. I am here to look after this matter a little bit. We could have ten million cans of sweet corn in the little county of Prince Edward, and we are here to ask if you cannot see your way clear to help us to develop the canning industry of Ontario.

Prof. ZAVITZ: The results of the co-operative experiments with sweet corn will come up later. Our co-operative work with sweet corn has been more particularly with corn for home use than with corn for canning purposes. Sweet corn is being tested in both the Field Husbandry and the Horticultural departments, and I know that the latter department has been conducting some canning tests during this year. The canning industry will be looked after as well as possible.

A MEMBER: How does Genesee Valley corn compare as to earliness with the rest?

Prof. ZAVITZ: I think probably it is a couple of days earlier than the Compton's Early, and also slightly earlier than the King Phillip.

Mr. SMITH: How do you account for the great falling off in the yield of oats this year?

Prof. ZAVITZ: The cold, backward spring and the unfavorable weather conditions. The early varieties have given the best results this year.

Mr. SMITH: Year after year, the Daubeney and the Mandscheuri together gave much greater yields than the Mandscheuri alone. This year, the combination is 100 pounds less than Mandscheuri. Would you recommend growing this mixture for feed?

Prof. ZAVITZ: Yes, most decidedly, when grown under uniform conditions. These tests were not made on the same farms. These grains have practically always given much larger yields, if grown together, than if grown separately.

A MEMBER: Would you sow that mixture as grown, or would you make a fresh mixture every year?

Prof. ZAVITZ: I would mix the oats and the barley in definite proportions each year. You would find that in your mixed crop there would be a larger proportion of barley than was sown. Barley will increase more rapidly than the oats, and if you take the seed from the mixed crop you will get a different proportion of the two grains. We have taken twelve different kinds of grain and mixed them together in the proportion of eight and one-half per cent. of each, and in the resultant crop found that, instead of there being eight and one-half per cent. of barley, there was eighteen per cent. Barley will come out on the top in the fight every time.

A MEMBER: What proportion do you sow?

Prof. ZAVITZ: We have sown nine different proportions for six years, and so far we have obtained the largest yield by growing one bushel each by weight, 34 pounds of oats and 48 pounds of barley. In the dry seasons we have obtained slightly better results by sowing a bushel and a half of barley and a bushel of oats. Taking six years into consideration, however, a bushel of each gave us the best results.

A MEMBER: What time was the millet sown?

Prof. ZAVITZ: We have been carrying on experiments in sowing each of three varieties of millet at different dates, starting quite early in the spring and sowing every two weeks all summer, and we found that we got the largest yield per acre from sowing about the middle of June.

A MEMBER: I sowed some millet this year about the second week of July, and it grew all right, but it was not worth cutting.

Prof. ZAVITZ: Was it too late in growing?

A MEMBER: The weather was dry and it did not grow well. I got it for the Japanese Panicle.

Prof. ZAVITZ: Was it brown or black seed?

A MEMBER: It was brown seed.

Prof. ZAVITZ: The seed was that of the Japanese Barnyard millet and not Japanese Panicle. The seedsmen are all mixed up with regard to these millets, and if you look at a number of the catalogues you will find that they are illustrating one variety and describing another. They illustrate Japanese Panicle and they describe the Japanese Barnyard millet, which is another millet and has a brown seed, and an entirely different form of head, and gives decidedly lower results. If you are asking for the Japanese Panicle millet, be sure you get seed that is black or very dark brown, almost round, and very shiny.

A MEMBER: How does the Empire State potato stand as regards resistance to rot and blight?

Prof. ZAVITZ: It is rather better than the average with respect to the freedom from rot. It is about as good as any of the varieties that are grown very extensively, and it is very much better than some of them. There are a few of the newer varieties that are fairly free from rot, but the trouble is that most of these varieties that seem to be fairly immune to rot seem to be either poor yielders or poor in quality.

A MEMBER: Have you the Delaware?

Prof. ZAVITZ: Yes, we have had the Delaware variety in our own experimental plots for years.

Q.—Does it not yield as well as the others?

A.—No, it has not yielded nearly as well as the Empire State.

In this summary report we have to speak of the Province either in large districts or as a whole. I wish we could classify the Province into smaller sections, and go more into detail and find out the results of the tests of the various neighborhoods. Our co-operative work does that in an admirable way, but it is impossible to bring out the detailed results in the time at our disposal at the annual meeting. We are taking experiments right to the farmer, and he can find out for himself, and that is the real foundation of our co-operative work, and if it was not for that we would drop our work at once.

Mr. NASH: I had an idea that you could plant an early potato very early and get it out of the way before it would be subject to blight. I had an early strain of Ohio potatoes, and planted them early, and got them out of the ground as soon as possible and there was no rot, and the others were badly blighted.

Prof. ZAVITZ: Some early varieties are almost free from blight. Stray Beauty and Early Pinkeye potatoes are two of the freest from rot. We have not found a potato yet but what has at least a slight tendency to rot. The varieties of potatoes vary from about two and a half to forty-two and a half per cent. of rot.

Mr. MASON: Would that be after spraying?

Prof. ZAVITZ: We used the Bug Death, which is supposed to check the rot, but it does not stop it. The Beauty of Hebron potato, known quite well throughout Ontario, and still grown quite extensively, is one that is most subject to the rot of all the potatoes we have tested, averaging over 40 per cent. of rot.

Q.—What is the best variety of sweet corn?

Prof. ZAVITZ: We are testing sweet corn more for home use than for commercial use in the Union work. We distributed three varieties in the spring of 1907 for the people to test at their homes. You ask me the best variety of sweet corn in Ontario for home use, and I can give you no other answer except that my own opinion, and that of the experimenters throughout Ontario, is that the Golden Bantam is the best. I was told at one place, that if I would run for Member of Parliament with the Golden Bantam corn as one of the planks of my platform, my election would be assured. It is very tender, juicy, and sweet. If you want a fine sweet corn for your table, try the Golden Bantam. We have sent it out for experimental purposes for three years, and it has been the most popular variety and has been reported to be the best quality of the varieties tested in each of the three years.

Prof. HUTT: As a rule we have been in the habit of planting several varieties of corn each season, but after trying the Golden Bantam for a few seasons and finding out the value of it, and its extreme earliness, we are planting it now in succession, and we have in it one of the very best corns. It makes a good one to plant in succession and gives a first-class corn from the first to the last of the season and it keeps for a long time in a fit state for use.

A MEMBER: Is any consideration given to the nature of the ground on which these experiments with commercial fertilizers are conducted?

Prof. ZAVITZ: Yes, we ask every experimenter to sow the fertilizers upon the average soil of his farm so that he may learn as correctly as possible the requirements of his own farm. In reporting, the man states the kind of soil he uses in every case. We have taken the average results of clay soils

and of sandy soils and of muck soils, and the separate results of all these are given in the report.

A MEMBER: What time in the season were these fertilizers applied?

Prof. ZAVITZ: The muriate of potash, superphosphate, Royal Canadian and potato fertilizers, and the cow manure were all applied at the time the potatoes were planted. Cow manure was mixed through the soil to a depth of about 3 or 4 inches and the fertilizers were worked in the soil about 2 inches from the surface. Later on, when the plants were up about 2 inches, the nitrate of soda was sown and then the soil was again stirred on all the plots to a depth of about 2 inches, so that those that got the nitrate of soda would get no special advantage over the others from the cultivation.

A MEMBER: Were the fertilizers all put on broadcast?

A.—Yes, all were sown broadcast.

Q.—What about putting manure on in the fall for next year's root crop?

A.—A good many people are doing it with a good deal of satisfaction.

Q.—Is it better worked in in the fall?

A.—We find it is a very good thing to put it on in the fall and then ridge up the land before winter sets in. When you put a cultivator on it in the spring, it crumples down beautifully and leaves the land in splendid condition.

Q.—Have you a chart to show the results of your work with commercial fertilizers at the College, as compared with the average work of the farmers throughout the Province?

A.—Yes, I have in my office, and we have part of the results in some of the College reports. There is no report which has all the work with fertilizers together in the one place.

Q.—My recollection is, that in your own work you show results very much better than that?

A.—Yes, we have higher yields and in some cases rather greater differences. Generally speaking, however, the results of the co-operative work correspond with our college work very closely indeed.

Q.—And the results you have obtained have been similar to the results obtained in Europe and the United States?

A.—That is quite true in a general way.

Mr. MASON: You actually got profitable results from the fertilizers in every case where your land was cultivated, but not in the grain crops?

Prof. ZAVITZ: If we apply fertilizers to such crops as potatoes and roots we get very good returns. Fertilizers can sometimes be used to very great advantage with garden stuff, and with potatoes and mangels and beets and turnips, but we have found that it has been very difficult to use fertilizers with grain crops and to do it economically. I have even greater hopes for the future than ever before with regard to the work of the Experimental Union. (Applause.)

The CHAIRMAN: I hope in the near future we may see our way clear to have these meetings occupy a whole week. I do not think the farmers of the country can spend a week more profitably than in the discussion of the year's experimental work.

WHAT WE EXPECT FROM THE GRADUATES OF THE AGRICULTURAL COLLEGE.

By Hon. Nelson Monteith, Minister of Agriculture, Toronto.

I regret, indeed, that I was unable to be with you yesterday to hear what you had to say upon the great problems relating to agriculture. I am glad to be with you this morning, and I am especially pleased to learn that the past year has been a most successful year under your Presidency; and I am also well pleased to believe that you have made a wise selection in your President for the next year. (Applause.) I can speak with a certain amount of knowledge of Mr. Brodie. As sons of the soil, we same to this Institution some twenty years ago, and joined fortunes as room mates at the O.A.C., and through the College work of three years, Mr. Brodie secured a very high standard. I am glad to know that Mr. Brodie has brought a great deal of credit to the College since leaving its halls, and his example should be an incentive to the young men who are here this morning, many of them questioning in their minds as to whether they should go back to the farm, with what so many believe the accompanying drudgery, or whether they shall seek a wider field in the commercial world.

We are glad to know that honor has been brought to this College by men in other lines than that of agriculture and the farm. Graduates from this Institution are doing splendid work to-day in newspaper work, where we believe their influence for popularizing this institution, and for raising agriculture to that dignity which properly belongs to it, will be great.

I want to say a few words this morning as to what we expect from the graduates of this institution. You have a very large part to play on the agricultural stage as it is constructed to-day. In this great Province of Ontario, you are the men that the farmers, I am glad to say, look to, to a certain extent, along agricultural lines. It was not so at the time I was a student here. At that time we had to walk very gingerly when we went home; in fact we had to be very humble, and lowliness was the ladder we had to climb. We had to start in a very modest way, and assume very little as to what we had learned here. At that time it was thought we were taught at this College to plow straight, and that that was the chief object of this institution. Things have changed since then. Men are beginning to read, and our farmers are beginning to become intelligent as to the work of this institution; and they now look to you as experimenters, and as men, to lead them onward in this work. What I wish to impress upon you is that we have found the young men of this institution just a little too modest when we have called on them to go out in connection with the organization of Farmers' Clubs and of Farmers' Institute work. I believe you have the ability to do this work, but apparently you are not at all anxious. I appreciate the fact that the majority of our young men, when they go back from the College to the farm, have a difficult struggle in dealing with the problems of hired help, of the finance and of the business of the farm, and that they are compelled to apply themselves closely, but we should have now a number of our young men who have got over that stage and who are in a position to come forward and give their services for the uplifting of Agriculture.

I have not much to say further, but I thought the opportunity was so good that I would be guilty should I neglect to impress that fact upon you, that we are looking to the young men of this institution to help carry forward the great work of agriculture. We are glad to know that a number of our young men have been teaching along agricultural lines at various points in

the Province. We believe this will be developed further during the next year, and through School Gardens will be able to get into closer touch with this institution. I believe if we can sow the seed early that the crop will be more abundant than it is at the present time. I thank you, Mr. President, for this privilege of speaking a few words to the men who, I believe, are largely guiding the destinies of this country. (Applause.)

CO-OPERATIVE EXPERIMENTS WITH VEGETABLES AND IN FRUIT GROWING.

By Prof. H. L. Hutt, O.A.C., Guelph.

The co-operative testing of vegetables through the Experimental Union was taken up this year for the first time, the plan adopted being much the same as that by which we have been testing fruits for the past fifteen years. As with the fruits, the work has begun with a few of the varieties which have given the best results in our experiments at the College.

Experiments with Vegetables.

The crops with which experiments were conducted this year were beets, carrots, lettuce, and tomatoes, three of the leading varieties being sent out for each test. We hope to extend the work next year by adding other classes of vegetables upon which careful experimental work has now been done at the College. Seeds were sent out for 1,481 experiments. These were sent into every county and district in the Province.

One of the objects of this work is to call attention to the importance of the vegetable garden as an adjunct to the home, not only in the country where it has been sadly neglected, but also in towns and cities where the small backyards may be so utilized to good advantage. These small but carefully conducted tests all over the country can be made a strong factor in promoting the economic side of rural and civic improvement which will tend to an improvement of the home and its surroundings generally.

School Children Interested in Experiments.

As all of this work has its educational as well as its practical value, it was thought wise to introduce it into the schools of the Province. With this end in view, we communicated with all the school inspectors to find out how many of the schools in Ontario were interested in school gardening. In this connection we may say that every inspector who had schools with school gardens in his inspectorate, appeared to be proud of them, and most of those who had not were desirous of having them established. In this way, we were able to introduce these co-operative tests into about thirty schools,—every school having a school garden—and also in some schools where gardens have not yet been established. In the latter the pupils took the seeds home and grew them in their own gardens.

As an example of the interest taken in this work by the school children, we may refer to what was done by the school children in the city of Guelph, where, through the hearty co-operation of the teachers, over five hundred children conducted experiments in their own gardens most successfully. Recognizing the importance of this work, the directors of the Guelph Central Exhibition gave additional encouragement to it by offering $35 in prizes for the children's exhibits in connection with these experiments. The result was that the children's exhibits became one of the chief features at the

exhibition this year, and the interest shown by the scores of enthusiastic young exhibitors put new life into this section of the exhibition. We trust the good results obtained here may extend to other parts of the Province.

Bulletin Directions.

A little bulletin giving carefully prepared cultural directions for conducting the test, and a blank form upon which to report the results at the end of the season accompanied each lot of seed sent out. Many of the experimenters stated that the information given in the cultural directions would be of even more use to them than the experiment itself. However this may be, there is no doubt that the information given in the circular will be helpful to many in growing these various crops in future.

The cultural directions for each experiment are given herewith in connection with the various experiments.

Experiment with Beets.

The varieties distributed for this test were: Eclipse, Early Model, and Black Red Ball. The first is one of the old standard varieties which has long been known as one of the best, the other two are newer varieties of excellent quality, but not yet well known.

Cultural Directions.

1. Locate the plot for the experiment far enough away from buildings or trees that the crop may not be interfered with by shade or tree roots.
2. Select as nearly uniform soil as possible, and give the same treatment to each variety throughout the season.
3. Prepare the ground thoroughly, making a fine, mellow seed bed.
4. Mark out for sowing the seed, three parallel straight rows, 2 or 3 feet apart and 20 feet long.
5. The seed should be scattered evenly in the rows, about half an inch deep, and the soil should be firmed over the seed with hoe or rake.
6. For summer use the seed may be sown as soon as the ground is dry enough to work in the spring.
7. For winter storage, sow the seed the latter part of May, or first of June. The later sowing gives a better quality of beets for winter use.
8. Care should be taken to keep the varieties distinct and properly labelled. Wooden stakes, painted white, upon which the name can be written with a lead pencil, answer the purpose well. It is advisable also to make a record of the planting in a note book, in case a label should be lost.
9. Begin cultivation as soon as the plants appear above ground. Keep the ground well tilled to conserve soil moisture and stimulate growth of the crop.
10. Where a one-horse cultivator cannot be used, a wheel-hoe does good work, and is a great labor saver in the garden.
11. As soon as the plants are a couple of inches high, thin them out to two inches apart in the row. A hand-weeder is a great labor-saver at this work.
12. When the beets are about an inch and a half in diameter, begin to use them. Thinning out again so as to leave the beets for the main crop four inches apart.
13. At this time carefully weigh and record the weight of ten averaged-sized beets of each variety as dressed for boiling. In preparing the beets for boiling, do not cut off the leaves and roots too close to the main root, which causes loss of color in boiling.
14. Cook separately the samples of each variety and compare their quality.
15. Harvest the crop before it is injured by severe fall frosts. After weighing, store in moist sand or soil in a cool, moist cellar.
16. Carefully weigh and record the weight of ten average beets of each variety before storing.
17. Look over your report carefully and see that all of the particulars of the experiment are properly recorded. Make a copy of it to keep for future reference.
18. Kindly forward the report as soon as possible after harvesting the crop.

The Results.

Four hundred and forty-nine experimenters took part in this experiment. The results show that Eclipse was the favorite with the majority of the experimenters, as it matured the earliest and gave a good crop of fair quality. Early Model ranked second in popularity and Black Red Ball third, although many of the experimenters state that the latter was of better quality and finer appearance than either of the others. It is smaller and later in maturing.

Observations by Experimenters.

The following are some of the practical observations made by the experimenters with regard to their experience with this experiment:

J. L., Ashburn, Ontario County, who has had forty years' experience growing beets, says: "Your cultural directions will be of the greatest use to me in the future."

R. B. A., Kells, Nipissing District, who has had thirty years' experience, says: "I do not remember ever having had a better crop. I consider the Black Red Ball the best for table use."

J. McO., Ignace, Rainy River District, says: "You may know by this time that we had no summer in this district this year. I have learned the importance of keeping books and not planting until we have summer for sure, then keep the hoe going as often as possible."

A.W., Mt. Brydges, Middlesex County, who has had over thirty years' experience, says: "I never in my time have grown better beets. I think the seed you send must be better than we usually get at the country store."

J. B., Minden, Haliburton County, considers the Eclipse the best for his soil and locality, and says: "I will always get seed of that variety to plant, if possible."

J. W. W., Rodney, Elgin County, after fifteen years' experience, says: "We never had beets that were so tender. I have learned that in order to have good winter beets the sowing of the seed must be left until June as the spring sown beets get tough before fall."

S. M. O., Bracebridge, Muskoka District, says he has learned the importance of testing each variety by weighing and keeping a record of the results.

A. R., Hogan, Hastings County, says: "I think the Black Red Ball is the finest flavored beet we have ever used."

I. M. L., Solina, Durham County, says: "The dark beets like Black Red Ball sell best on the market and look best on the table."

W. C., Bruce Mines, Algoma, prefers Eclipse and says that the beets of the best quality do not always get the prize at the fall fairs, and that, as a rule, in his district the prize goes to the largest beet no matter what the quality.

In this connection, we may add that judges at fall fairs should consider the quality in judging garden vegetables, for it is not the largest roots that are of the best quality.

EXPERIMENTS WITH CARROTS.

The varieties distributed for this test were Chantenay, Danvers Half-long, and Rubicon. The first is one of the old standard varieties and the others newer varieties of good promise.

CULTURAL DIRECTIONS.

1. Locate the plot for the experiment far enough away from buildings or trees that the crop may not be interfered with by shade or tree roots.

2. Select as nearly uniform soil as possible, and give the same treatment to each variety throughout the season.

3. Prepare the ground thoroughly, making a fine, mellow seed bed.

4. Mark out for sowing the seed, three parallel straight rows, 2 to 3 feet apart and 20 feet long.

5. The seed should be scattered evenly in the rows, about half an inch deep, and the soil should be firmed over the seed with hoe or rake.

6. For summer use the seed may be sown as soon as the ground is dry enough to work in the spring.

7. For winter storage, sow the seed the latter part of May, or first of June. The later sowing gives a better quality of carrots for winter use.

8. Care should be taken to keep the varieties distinct and properly labelled. Wooden stakes, painted white, upon which the name can be written with a lead pencil, answer the purpose well. It is advisable also to make a record of the planting in a note book, in case a label should be lost.

9. Begin cultivation as soon as the plants appear above ground. Keep the ground well tilled to conserve soil moisture and stimulate a vigorous growth of the crop.

10. Where a one-horse cultivator cannot be used, a wheel-hoe does good work, and is a great labor saver in the garden.

11. As soon as the plants are a couple of inches high, thin them out to an inch and a half apart in the row. A hand-weeder is a great labor saver at this work.

12. When the carrots are about an inch in diameter, begin to use them. Thinning out again so as to leave the carrots for the main crop three inches apart.

13. At this time carefully weigh and record the weight of ten averaged-sized carrots of each variety without the tops.

14. Cook separately the samples of each variety and compare their quality.

15. Harvest the crop before it is injured by severe fall frosts. After weighing, store in moist sand or soil in a cool, moist cellar.

16. Carefully weigh and record the weight of ten average carrots of each variety before storing.

17. Look over your report carefully and see that all of the particulars of the experiment are properly recorded. Make a copy of it to keep for future reference.

18. Kindly forward the report as soon as possible after harvesting the crop.

The Results.

Three hundred and ninety-seven experimenters conducted the test with carrots. The reports sent in show that Chantenay was the favorite with the majority of the experimenters, because of its earliness, smoothness and good quality. Danvers Half-long, and Rubicon ranked in the order named and were highly spoken of by many of the experimenters.

Observations by Experimenters.

The following are some of the practical observations by experimenters.

M. B., Guelph, Wellington County, who never grew carrots before, says: "Taking care of the carrots will help me to grow other vegetables in the future."

J. M., The Pines, Lennox County, says: "I have learned the importance of early seeding, careful cultivation and proper attention to thinning out the crop."

R. T., Couttsville, Temiscaming District, says: "I have learned that carrots require more room than I have been accustomed to give them."

H. R., Harrisburg, Brant County, who has had ten years' experience in growing carrots, says: "I have learned that June sowing is better than early sowing for winter use."

A. B., Bruce Mines, Algoma, says: "From the seed sent I had seven bushels at harvest time. The Rubicon was the heaviest cropper, but I consider the Danvers best for quality."

I. B., Listowel, Perth County, who grew carrots this year for the first time, says: "By following your instructions, I obtained better results than my neighbors, for I got first prize at the North Perth Fair."

W. McK., Mitchell, Perth, who has had forty years' experience, says: "I never had a better crop of garden carrots. I took second prize at the Mitchell Show. The seed obtained from you was better than we usually get."

J. B., Woolverton, Oxford County, says: "We captured the red ticket for carrots at our Fall Show open to the world."

J. M., Utica, Ontario County, says: "This was my first attempt at growing carrots, and I do not see how I could improve on this year's crop. The carrots were ahead of any that old growers here have ever seen."

T. T. M., Acton, Halton County, who has had fifty years' experience, says: "All varieties did well. I never had as good a crop before. The seed was excellent."

G. R., Falconbridge, Middlesex, says: "I put Chantenay first. I do not think there is any better. I would like to get a pound of seed of this variety next year if possible."

Experiment with Lettuce.

The varieties sent out for the test with lettuce were, Black-seeded Simpson, Denver Market, and Hanson. These are a few of the best among ninety varieties which have been tested at the College during the past two years.

Cultural Directions.

1. Locate the plot for the experiment far enough away from buildings or trees that the crop may not be interfered with by shade or tree roots.
2. Select as nearly uniform soil as possible, and give the same treatment to each variety throughout the season.
3. Prepare the ground thoroughly, making a fine, mellow seed bed.
4. Mark out for sowing the seed, three parallel straight rows, 2 to 3 feet apart and 20 feet long.
5. The seed should be scattered evenly in the rows, about half an inch deep, and the soil should be firmed over the seed with hoe or rake.
6. For early use the seed may be sown as soon as the ground is dry enough to work in the spring.
7. For a succession of crisp, tender lettuce, a second sowing should be made a month later. If a second sowing is desired, sow only half of the seed of each variety at first, and keep the other half for the later sowing.
8. Care should be taken to keep the varieties distinct and properly labelled. Wooden stakes, painted white, upon which the name can be written with a lead pencil, answer the purpose well. It is advisable also to make a record of the planting in a note book, in case a label should be lost.
9. Begin cultivation as soon as the plants appear above ground. Keep the ground well tilled to conserve soil moisture and stimulate growth of the crop.
10. Where a one-horse cultivator cannot be used, a wheel-hoe does good work, and is a great labor saver in the garden.
11. As soon as the plants are a couple of inches high, thin them out to three inches apart in the row. A hand-weeder is a great labor saver at this work
12. Begin to use the lettuce as soon as the plants are large enough, thinning out each alternate plant, thus leaving the plants six inches apart.
13. When they begin to crowd at this distance, thin out again, leaving them one foot apart, at which distance they should form large, compact heads.
14. Carefully weigh and record the weight of four of the largest heads of each variety when full grown and in the best condition.
15. Look over your report carefully and see that all of the particulars of the experiment are properly recorded. Make a copy of it to keep for future reference.
16. Kindly forward the report as soon as possible after harvesting the crop.

The Result.

Two hundred and seventy-nine experimenters took part in the test with lettuce, and there was much diversity of opinion regarding choice of varie-

ties. Most of them conceded Hanson to be the strongest growing and earliest maturing, but many thought the other varieties of better quality. For general popularity the varieties ranked in the following order: Hanson, Black-seeded Simpson, and Denver Market.

Observations by Experimenters.

The following practical observations were made by experimenters:

E.P., Denbigh, Addington County, says: "I have learned the importance of sowing as early as possible in the season. For my locality I put Hanson first and Black Seeded Simpson second.

E. K., Aylmer, Elgin County, who has had fifteen years' experience, puts Denver Market first and Black-seeded Simpson second. He says: "I have learned the importance of early planting and systematic thinning."

E. B., Ottawa, Carleton County, says: "I was greatly pleased with the results produced by following your instructions. Quite a number of the heads of all three varieties grew quite solid, and the inner leaves were very fine and tender."

C. L., Ridgemount, Welland County, says: "I have learned the importance of thinning at different times during the season to get the best results."

M. H., Baltimore, Northumberland County, says: "We found the lettuce most satisfactory, especially the Black-seeded Simpson. We used the lettuce through June, and July and part of August."

G. A. M., Carp, Carleton County, one of the school principals where school gardens have been adopted, says: "My children were delighted with the experiments, and followed your directions as closely as possible. We took $19.00 in prizes at the Fall Fair open to all. We had the best exhibit this year at the Carp and Huntley Fair. Hope you will again favor us with the opportunity of conducting experiments."

Experiments with Tomatoes.

The varieties sent out for the test of tomatoes were Earliana, Success, and Stone. The first is one of the best early varieties, while the others are later maturing kinds of better quality.

Cultural Directions.

1. If you have had experience in growing tomato plants, adopt what you have found to be the best methods of producing thrifty, stocky plants.
2. The seed should be sown about two months before the time the weather usually becomes warm enough for planting in the open, from the first of March to the first of April, depending upon locality.
3. The plants are best started in a greenhouse. Failing this, they may be started in a hot bed or window boxes in a warm room.
4. When the plants have their second pair of leaves, they should be transplanted into good soil in a hot bed, or plant boxes, setting them 3 or 4 inches apart.
5. Give them all the sunlight possible, water carefully, and guard them against frost or cold drafts.
6. As soon as danger of frost is past, the plants should be planted in the field from 4 to 5 feet apart each way.
7. Locate the plantation far enough away from buildings or trees that the growth may not be interfered with by shade or tree roots.
8. Set out as many plants as you choose, but six good plants of each variety should be selected and marked from which to record the yields for your report.
9. Care should be taken to keep the varieties distinct and properly labelled. Wooden stakes, painted white, upon which the name can be written plainly with a lead pencil, answer the purpose well. It is advisable also to make a record of the planting in a note book, in case a label should be lost.

10. Give good cultivation in order to maintain a loose earth mulch on the soil, which holds soil moisture and stimulates vigorous growth. The tomato plant responds readily to good cultivation.

11. When the plants begin to make heavy growths, spread the branches out in all directions and keep them near the ground so they will get all the sun and the earth heat possible.

12. Carefully weigh and record the weight of each picking, so that you may be able to report the total crop at the end of the season.

13. Look over your report carefully and see that all of the particulars of the experiment are properly recorded. Make a copy of it to keep for future reference.

14. Kindly forward the report as soon as possible after the last picking.

The Results.

This experiment was conducted by three hundred and fifty-six experimenters scattered all over the Province.

As the tomato requires a long, warm season to mature a full crop, naturally the results with this experiment depend largely upon the season and the locality. In northern sections of the Province where the seasons are shorter, only the earliest varieties can be brought to maturity, and in a cool season, like the one we have just had, even the earliest kinds do not always ripen. Earliana being one of the earliest varieties, naturally gave the best results this year in most sections of the Province. In southern sections, however, where tomatoes are largely grown, the Success and Stone, which are much later and of better quality, are the favorite varieties.

Observations by Experimenters.

The following practical observations are made by experimenters:

G. W. T., Hespeler, Waterloo County, says: "I have learned the importance of getting the plants started in good time with a sturdy, vigorous growth before planting outside."

C. B., Aultsville, Dundas County, who has had ten years' experience, considers Earliana the best for that district, and says, with him this experiment has introduced a variety of superior quality.

R. Y., Waubuno, Lambton County, says: "In ordinary seasons the Stone is the best tomato for this district, but Earliana is the best for a season such as we have just had."

G. M., Salsbury, Bruce County, says: "We have never weighed the crop before, and I think it gives a better idea of what the varieties really do."

W. F. E., Silverwater, Manitoulin Island, who has ten years' experience, says: "I have learned the importance of transplanting two or three times to make the plants stalky, and that more fruit ripens if the plants are kept near the ground."

S. E. R., Minden, Haliburton County, who has had ten years' experience, says: "Earliana is the best variety for this section, but even it did not ripen on the plants. I ripened most of the crop in the house after it was picked."

R. E. H., Dunnville, Haldimand County, prefers Success for his district but adds that, "Taking one year with another, the early varieties are the best; for, while they do not yield with the later kinds, the entire crop ripens before frost comes."

W. E. T., Bedford Park, York County, says: "Earliana is the most profitable variety for market."

W. L., Blue Lake, Brant County, says: "The Earliana tomatoes are smooth and of good quality and ripened when price was best on the market. I have saved seed from some of the best and earliest fruits."

E. B., Sarnia, Lambton County, says: "We had a good crop of tomatoes. The Earliana was the most profitable variety with us, as we ship all our crop

to the upper lake ports, and they are ready much earlier than the other sorts. In our experiment we could not see much difference between Stone and Success. I intend to try these two sorts on a larger scale next year. The Earliana is valuable on account of its earliness, but its quality is not of the best, and it does not take on the market when the other better sorts are ready."

EXPERIMENTS IN FRUIT GROWING.

In presenting a report upon the co-operative experiments in fruit growing, I am pleased to say that more has been accomplished this year than ever before. From the small beginning made fourteen years ago with sixty experimenters, we now have over five thousand experimenters engaged in this work. This year alone plants were sent to twenty-three hundred and ninety-two experimenters. These experiments are now being conducted in every county and district of the Province, and I am pleased to note that they are most eagerly taken up in those districts where fruit is not largely grown. In this way the work is reaching those who need it most.

Plan of Distribution.

Early in the year an announcement is made in all of the leading papers of the Province and a circular is also sent to all of the previous experimenters who have duly reported on the material sent them, that plants will be sent by mail, free of charge, for testing, on the understanding that those who receive them will follow the directions furnished and report results at the end of each season as requested.

The trees and plants for these experiments are purchased from nurserymen who make a specialty of growing good stock and putting it up in good condition for distribution by mail. We are obliged to make use of the mail because in many cases experimenters live so far away from express offices or railroads that it would be impracticable to reach them in any other way.

Records Kept.

A record is kept in our office giving the name and address of each experimenter, the kind of plants sent him for testing, and a brief record is made each year of his report upon the same. Naturally, some of the experimenters for one cause or another fail to keep their promise and report the results. Some drop out after two or three years, and there are many who have been engaged in this work almost from the beginning and have been sending in regular reports. In this way we have a list of careful experimenters all over the Province, the results of whose experiments are not only of value to us, but to themselves and the neighborhood in which they live.

Plants Distributed for Testing in 1907.

The following is a list of the experiments offered in the spring of 1907. This list shows the various classes and varieties of each offered for testing. The varieties selected make a good general collection for home use, and in most cases cover the season from early to late. They have been selected after years of careful testing in our experimental plots here and at the various Fruit Experiment Stations throughout the Province, as the ones most likely to give good results throughout the country.

No. 1. *Strawberries.*—Splendid, Fountain, Ruby, and Parsons—12 plants of each.

No. 2. *Raspberries.*—Cuthbert, Golden Queen, Marlboro', and Columbian—6 plants of each.

No. 3. *Black Raspberries.*—Gregg, Kansas, Palmer, and Older—6 plants of each.

No. 4. *Blackberries.*—(Adapted only to *Southern sections of Ontario) Agawam, Eldorado, Kittatinny, and Snyder—6 plants of each.

No. 5. *Currants.*—Fay, Red Cross, Victoria, and White Grape—2 plants of each.

No. 6. *Black Currants.*—Champion, Lees, Naples, and Black Victoria—2 plants of each.

No. 7. *Gooseberries.*—Downing, Pearl, Red Jacket, and Whitesmith—2 plants of each.

No. 8. *Grapes.*—(For *Southern Ontario) Concord, Wilder, Niagara, Lindley, Brighton, and Vergennes—1 vine of each.

No. 9. *Grapes.*—(For *Northern Ontario) Champion, Worden, Winchell, Delaware, Lindley, and Moyer—1 vine of each.

No. 10. *Apples.*—(For *Southern Ontario) Primate, Gravenstein, McIntosh, Blenheim, Rhode Island Greening, and Northern Spy—1 tree of each.

No. 11. *Apples*—(For *Northern Ontario) Transparent, Duchess, Wealthy, McIntosh, Scott's Winter, and Hyslop Crab—1 tree of each.

Cultural Directions.

A little bulletin of carefully prepared cultural directions is sent to each experimenter giving full directions for conducting the experiment with the kind of fruit sent him for testing. In many cases experimenters report that these directions are of great value to them, not only in the care of the particular fruit sent, but for the care of other fruits which they are growing. As these directions were printed in full in our last annual report they need not be repeated at this time. Copies may be had from us any time upon application.

Conditions for Planting.

The past season was, in many respects, rather unfavorable for the planting of nursery stock. The spring opened up very late and was cold and backward. In many parts of the Province there was extreme drought during the summer. For this reason experimenters have not had as good results with their planting as usual. Some report entire loss of plants, but the majority have succeeded in saving a few plants of each variety. With most of the fruits, they are then soon able to propagate more for themselves, and can conduct the test on a larger scale with plants of their own growing, and in such cases the results are always more satisfactory than with plants received from a distance.

Experiment No. 1, Strawberries.

During the past fourteen years strawberry plants have been sent to 2,128 experimenters. This year plants were sent to 713 experimenters. The list of varieties of strawberries sent out has varied from year to year, in order to include the best of the new varieties which appear from time to time. Over

*This division of the Province into North and South may be approximately made by a line running from Collingwood to Kingston.

four hundred varieties of strawberries have been tested in the experimental plots at the College during the past fourteen years, and it has been found that the older varieties gradually run out and are being superseded by newer and better kinds. The varieties distributed this year were, Splendid, Fountain, Ruby, and Parson's Beauty. Results upon the fruiting of these will not be received until next year. The varieties distributed last year were, Splendid, Clyde, Tennesee, and Irene. The reports upon these show that Clyde and Tennesee have been the heaviest yielders, but as neither of these are of the best quality, being too light in color and not firm enough in texture, it has been thought best to replace them by Ruby and Parson's Beauty, varieties of better color and quality. Splendid has given excellent results as an early variety and Irene has done well as a late one.

In the cultural directions furnished to experimenters, it is recommended that a new plantation be set out each spring with plants from the plantation set the year before, that they receive good cultivation, and not be allowed to fruit the first season. In the fall after the ground is frozen hard, plants should be covered with strawy manure for winter protection. On the whole, it is better to take out one crop from the plantation than attempt to fruit it for two years.

Experiment No. 2, Raspberries.

Plants for this experiment were sent this year to two hundred and six experimenters. In all, six hundred and ninety-one experimenters have taken up this experiment. The varieties distributed for testing have been Marlboro,' Cuthbert, Golden Queen, and Columbian. These have been selected as a desirable collection for home use, covering the season from early to late, and should hardly be compared in point of yield. Marlboro' is one of the best early red varieties. Cuthbert is the leading variety for main crop and one of the best quality. Golden Queen is practically a yellow Cuthbert and is one of the best yellow varieties. Columbian is one of the purple cane varieties and produces purple colored fruit. By many experimenters it is reported as the most productive of the lot and by some is preferred for home use, although the fruit is not, as a rule, so attractive nor rich in quality as that of Cuthbert.

Experiment No. 3, Black Raspberries.

Plants were sent this year to one hundred and eighty-five experimenters, and six hundred and thirty-one have received plants for this experiment within the past fourteen years. The varieties distributed for several years past have been Gregg, Kansas, Palmer, and Souhegan. This year Souhegan was dropped from the list and Older substituted. The Older has proved to be one of the hardiest of the black raspberries. It has been included in the test with the expectation that it will succeed where most of the other varieties have proved too tender. Gregg has given the best results in southern sections of the Province where it is more or less extensively grown. Kansas and Palmer rank next in the order named, and have succeeded farther north than Gregg, but neither of them is equal to it in quality or in size of berry.

Experiment No. 4, Blackberries.

Seventy-two lots of blackberries were distributed this year, and four hundred and seventeen have been sent out during the past twelve years. The varieties distributed were Agawam, Eldorado, Kittatinny, and Snyder. Blackberries are the least hardy of any of our bush fruits, and for this reason we mention in our list that they are adapted only to southern sections of the

Province. Agawam and Eldorado have proven to be the hardiest and have succeeded farther north than the other varieties. Kittatinny is still the favorite in southern sections of the Province and is one of the best where it succeeds.

Experiment No. 5, Currants.

Currant bushes were distributed to eighty-five experimenters this spring, and four hundred and sixty-eight experimenters have taken up this experiment during the past fourteen years. The varieties included in this test are Fay, Red Cross, Victoria, and White Grape. Fay has been the favorite with many experimenters because of its extra large fine fruit. Red Cross and Victoria have in many cases given heavier yields, and by some are preferred because of their extra productiveness. The White Grape currant is one of the best of the white currants, and in many cases has proved to be the heaviest cropper on the list. For home use this is one of the best of the currants, but for market the white varieties are not so much in general favor as the reds.

Experiment No. 6, Black Currants.

Plants were sent this year to one hundred and ten experimenters. Three hundred and three experimenters now have plants of these under test. The varieties sent out for this experiment were, Champion, Lees, Naples, and Black Victoria. Reports from experimenters vary considerably regarding results with these varieties. In some cases Champion and Lees have given the heaviest yields, but nearly all experimenters concede that Black Victoria is one of the largest fruited varieties in the test. The currants are among the hardiest of our bush fruits and succeed in all parts of the country. Some of the best yields are reported from Muskoka and Algoma, where some of the more tender fruits do not succeed.

Experiment No. 7, Gooseberries.

Gooseberry bushes were sent this year to one hundred and thirty-seven experimenters. Six hundred and seventy-four experimenters have now received plants for this test. The varieties distributed have been Pearl, Downing, Red Jacket, and Whitesmith. The majority of the experimenters report Pearl as the heaviest yielder, with Downing and Red Jacket ranking in the order named. All of these are of the American type of gooseberry, and are more or less exempt from attacks of mildew, to which Whitesmith, which is one of the European varieties, is subject. Wherever Whitesmith can be grown, free from mildew, however, it is one of the best varieties because of its extra large fine fruit.

Experiments Nos. 8 and 9, Grapes.

Grape vines for co-operative testing were sent out last year for the first time. Four hundred and twenty-four lots have now been distributed, two hundred and seventy-four of which were sent out this year. As grape vines do not usually come into bearing until two or three years from time of planting we do not look for report on yields this year. As only the earlier varieties of grapes can be matured in the northern sections of the Province, two separate lists of varieties were offered, one for northern and one for southern Ontario. The northern list includes, Champion, Worden, Winchell, Delaware, Lindley, and Moyer, a few of the best early varieties of each color. The southern list includes Concord, Wilder, Niagara, Brighton,

Lindley, and Vergennes. These are among the best varieties of the various colors, but not to be depended upon to ripen in northern sections of the country where the seasons are shorter and vines have to be laid down for winter protection.

Experiment Nos. 10 and 11, Apples.

Apples were sent out for the first time last year. One thousand and eighteen experimenters have taken up these experiments, six hundred and ten lots being sent out this year. In making a selection of apples, the climatic conditions of the northern and southern sections have also to be considered. Those selected for the southern sections were Primate, Gravenstein, McIntosh, Blenheim, Rhode Island Greening, and Northern Spy. This makes an excellent selection of varieties for home use to cover the season from the earliest to the latest. For the northern section the list includes only the hardiest varieties which will be most likely to succeed where winter conditions are severe. These are Transparent, Duchess, Wealthy, McIntosh, Scott's Winter, and Hyslop Crab.

In order to send these trees by mail, it is necessary to send one year old trees which can be conveniently sent through the mails. Some of the experimenters have thought these were too small for planting in regular orchard and were advised to plant them in a nursery row for a year or two until they reach the regular size for orchard planting. These small trees, however, have the advantage in northern sections in that they can be headed down to within a foot of the ground and made to form low heads, which are less liable to injury from sunscald, one of the most troublesome injuries in northern sections. The majority of the experimenters report that the trees arrived in good condition and have done well considering the trying season. From the varieties sent, experimenters may select scions to graft into bearing trees and thus obtain fruit a few years earlier than waiting for the little trees to come into bearing. No report of fruiting from these can, of course, be expected for some years to come.

Conclusions.

In concluding this report, we may say that we are pleased with the progress which experimenters are making as evidenced by the reports sent in. As the work has an educational as well as a practical value, the greatest good from it naturally accrues to the experimenters who receive the plants, follow the directions, and carefully conduct the experiments. We are pleased to hear from many experimenters that their small plantations have become centres for distribution of plants to neighbors who have not been growing fruit. In this way the value of the work is extending, and we trust before long that there will not be a country home in this province that will not have its supply of fruits, at least for home use if not for market.

Mr. Hyatt: Are those directions for growing tomatoes, for commercial or for fancy growing?

Prof. Hutt: More for home use. What is the point you desire to make?

Mr. Hyatt: It won't work out for commercial growing.

Mr. Jarvis: I came up here to carry back some of the good things which you have to offer in such abundance, rather than to contribute to the programme, and I have been very much interested in the paper which has been presented. Although, I believe it is presumption on my part to comment upon it, yet one thing appeals to me, and that is the School Garden

idea, which has been introduced in this experimental work. I think it is a very commendable and unique idea, and worthy of elaboration.

In the vegetable work, the question of variety is one which is regulated largely by the use which it is intended to make of the crop, for there are different types of vegetables. It is not well to compare the varieties of vegetables, because the purposes for which they are intended are so varied. No doubt this paper will stimulate the experimental spirit, and will acquaint the grower with varieties, with which he is not familiar.

I think a line of experimenting in fertilizers might be taken up in co-operative work. I have conducted some experiments of this kind myself, during the past year, using different fertilizers, and putting them on at different times and seasons. That is something we have over-looked to a great extent. We had difficulty in growing cauliflower successfully in Connecticut, and I took up the cauliflower experiment last year, and made applications of different fertilizers and of combinations of fertilizers, and I did not get such a very great difference from the different kinds of fertilizers, as I did from the time of application. It has been believed that nitrogenous fertilizers applied late in the season to cauliflowers, would have an injurious effect, by producing too much leaf-growth, rather than compact growth, but this was not the case. Nitrogenous fertilizers applied just about the time the cauliflower was beginning to head, produced wonderful results, and by that treatment, we had the only good crop of cauliflowers we have ever been able to grow on the College grounds. I throw that out as a suggestion to show that there is a great field for investigation, as to the time of application of fertilizers.

I have been told that by using phosphoric acid, tomatoes may be matured from eight to fifteen days earlier. That is an important thing in our State. We have found we cannot use too much phosphoric acid in tomato growing.

Another feature that is important, is co-operation in the different methods of growing—the trellis system, the pole system, the single stem system, or letting them grow as they will. We have found that it is a good thing to grow tomatoes with particularly long stems. Lay it down and cover about a foot of it with soil, and you can develop the root growth twice the size that you will under ordinary conditions. With the roots coming out from the bottom of the stem, it is wonderful the amount of root-surface you can get. Our tomatoes set out in this way last year, were away ahead of anything else.

The question of rotation in vegetables could be very easily taken up. One of our leading growers in Connecticut, who tests all the new varieties in vegetables, grew fifteen different varieties of cabbage last year, and as many varieties of cauliflowers, and several new varieties of tomatoes. He grew one row of each, right through his garden. One-half of his plot was planted with beans the year before, and the other half with turnips, and there was a very marked difference in some particular kinds of vegetables. Some do far better where turnips were grown, and other kinds do better where beans were grown previously, and that was a lesson to me. I think it is one that we might all keep in mind.

We had trouble in maturing melons and squash last season. We were unable to mature the Hubbard squash under ordinary methods of growing. It was an adverse season. I think we can produce a variety of squash that will mature earlier, so as to avoid so great a loss. We have a cross between the Hubbard and the Marrow, which is very promising. It matures ten days to two weeks earlier than the Hubbard. I thank you for your attention. (Applause).

THE CHAIRMAN: I am sure we feel greatly indebted to Mr. Jarvis for the information he has given us, on the growing of these valuable crops.

Mr. HYATT: We engage quite extensively in tomato growing in Prince Edward county. We grow them for commercial purposes, and it means to us something enormous. Our friend here has given us some very good ideas for fancy growing, but when he comes down to commercial growing, he is not in it. You have to be careful in your selection, and have got to consider the appearance of the plant, flesh, and cultivation. It would take me an hour or two to give the whole system, to tell you the proper planting time, how to make a hot-bed and a cold-bed, and give you the reasons for it. I am pleased with what I have heard. It has been very instructive. You could not train them up if you were growing them for commercial purposes. We find that where their branches strike the ground, they will take root. One more important thing in cultivation, is to see that you have no root threads on the cultivator. Cutting the roots in this way is a check to the crop.

A MEMBER: The demand for the White Currant exceeds the supply in the Toronto market, and the people seem to have neglected to grow it.

Mr. HUTT: Where the market will take it, it will pay to go into it, because it will grow a greater crop than any other currant.

A MEMBER: I would like to ask Professor Hutt what is the best late strawberry for the main crop?

Prof. HUTT: Splendid, is our best early and for late Ruby and Parsons Beauty. In growing strawberries I would not want to be confined to less than four varieties.

Q.—Have you had Midnight?

A.—Yes; it is not a bad berry, but it does not yield enough. We have tested 400 kinds.

NAMING THE FARM.

MR. G. C. CREELMAN, PRESIDENT, AGRICULTURAL COLLEGE, GUELPH.

In a ten-minute talk I think it better to confine myself entirely to one small subject and I have chosen to say a few words to you to-day on "Naming the Farm." In this country there is such a decided tendency among farmers to leave the home place to strangers and to move to the towns and cities in declining years, that no distinctive home feeling attaches itself to many of our places. It is usually a question of, "How much can I get for the farm?" not, "Into whose hands may it pass?" The result is that as the young people leave home and go over into another township, another county, or into one of our large cities, they cannot return at Thanksgiving or Christmas to the farm upon which they were born or upon which they spent their childhood days.

I believe, therefore, that if our good farmers were to seriously decide upon a proper name for the farm and then keep the farm up to the name, it might lead to more permanent occupation and incidently serve to keep at least one of the best boys at home on the farm, with the hope of succeeding to the management of it fairly early in life.

The following are some of the reasons I would give why our farms should be named:

(1) Because all of our Provincial Ministers of Agriculture have done it, and the farms of each are incidentally a credit to the entire Province.

(2) Each of these Ministers has but one son, and all of these boys are still on the old home farms, and in two instances out of three have entire management of the place. The same, no doubt, will be true of the son of the present Minister of Agriculture when he becomes old enough.

(3) I believe it would mean better farming. No man could afford to place a good name upon a poorly farmed homestead. He would soon be the laughing stock of the country. On the other hand, he would want to live up to the name, in order that his immediate family and his neighbors might see what a good farmer he was.

(4) It would mean better buildings, which would be kept painted and in good repair and would present a good appearance from both outside and inside.

(5) It would mean a tidier place, as it would be constantly in the public eye, people would be talking about it, and untidiness of any kind would appear so glaring as to be quite out of place.

(6) The habit of tidiness and good farming leads to thrift, so that a man whose farm was well named would soon come to be a more prosperous farmer.

(7) When the place became well known, such a farmer would have no difficulty in disposing of his surplus stock or other farm produce, as he would be receiving the very best kind of advertising from his neighbors and others, who knew him to be thoroughgoing in all his farm operations.

How to Start.

I would suggest to all the young men present to-day that they take this matter into their serious consideration, and if any one decides now that he will during the Christmas vacation talk this matter over with his parents, I would suggest that the next step be that he present his father or mother with 500 or 1,000 sheets of first-class letter paper, upon which has been printed the new name of the old farm. This would be a start in the right direction and in a business way.

We are independent just as we make ourselves comfortable and happy, and we cannot possibly be independent in thought, in word, or in deed, if the things around us are in a disreputable condition and we are constantly behind in our work. Life is not worth living with the fences down, buildings unpainted, and in bad repair, weeds everywhere, and stone piles left in the field to be plowed around and harrowed around and mowed around generation after generation. Implements left out or jumbled all together in the corner of a driving shed is bad business from any standpoint; hence I make a strong appeal to you to name your farms and to live up to the name.

RESULTS OF CO-OPERATIVE EXPERIMENTS WITH FERTILIZERS IN SWAMP SOILS.

By Prof. R. Harcourt, Agricultural College, Guelph.

Swamps are, generally speaking, low lying areas, ponds, arms of lakes, etc., in which aquatic plants have lived and died and where the accumulations of this organic matter have gradually risen to the surface of the water and upon which vegetation of various kinds has developed. When these areas are drained, a mass of organic matter in different stages of decomposition and varying in thickness from a few inches to many feet is left. This is what constitutes the original swamp soils. When the accumulation

of organic matter is deep, there is apt to be poor aeration, low temperature, high acidity, and, consequently, poor nitrification. It is therefore, possible that in such soils, rich in nitrogen as they always are, there may be very little nitrogen in a form that plants can assimilate. These soils are also usually deficient in potash, although they frequently contain large quantities of lime and magnesia and about the normal amount, or a little less, of phosphoric acid.

On the other hand, where a certain amount of sediment from the surrounding uplands is mixed with the organic matter during the filling-up process, and when the temperature is more favorable, bacterial action is active and the organic matter decays rapidly. Such soils are naturally less acid and contain more potash and other mineral matter and may be brought into a productive condition very much more quickly than the deposit in a deeper and colder swamp. In Ontario to-day many of these swamp areas may be seen in various stages of the filling-up process, and much soil formed in this way is being drained and brought under cultivation with, as might be expected, varying results.

It has been found that, generally speaking, where the original growth of the swamp was tamarack or black spruce, the soil is unproductive. Swamp soil lying over sand is almost always reported as producing unsatisfactory yields, but when the subsoil is clay, especially when some of it is mixed with the top soil, the yields are usually excellent. As a rule, where the organic matter is deep, the crop returns are poor.

The object of our experiments was to co-operate with the owners of such soils to ascertain whether the application of lime, potash, and phosphoric acid would increase the productiveness of their particular soil. As it was impossible for us to make an examination of every soil before placing the experiments, we naturally have got quite varying results. Some experiments were placed on swamp land that had given good results; others were placed on swamp land in which the organic matter was not sufficiently decomposed to hold moisture or supply plant food; and still others were on soil that was insufficiently drained and wet weather destroyed the crop. We are glad, however, to report that in many cases the fertilizers used improved the crop and apparently made up for the deficiencies of the soil.

A general outline of the plan of the experiments and the results obtained are as follows:

EXPERIMENT 1, WITH CORN: The plots were one-tenth acre in size and were fertilized as follows:

Plot No. 1 ....200 pounds of muriate of potash per acre.
" 2 ....200 " " " " "
" 2 ....400 " Thomas phosphate "
" 3.....No fertilizers.

Six experimenters took fertilizers, and four gave complete reports.

The results are as follows:

Yield per acre.	Plot No. 1.	Plot No. 2.	Plot No. 3.
	Lbs.	Lbs.	Lbs.
Report 1—Weight of corn on cob	5,140	4,900	4,650
" 2. " " "	2,730	3,790	2,400
" 3 " " "	2,790	3,320	2,160
" 4 " " "	2,780	2,920	1,400

It will be noticed that in every case the potash used on Plot No. 1 increased the yield more or less, and that in three out of the four experiments the use of Thomas phosphate still further increased the weight of corn. In all cases, but especially in Report No. 4, the size of the cobs and the quality of the corn was very much improved.

EXPERIMENT II. WITH OATS: The plots were 1 x 2 rods, or one-eightieth of an acre, in size and the fertilizers were applied at the same rate as for corn. The following are the returns received:

Yield per acre.	*Plot No. 1.*	*Plot No. 2.*	*Plot No. 3.*
Report 1. Straw and Grain, lbs.	6,400	10,000	4,000
Grain, bushels	30.6	40.0	23.5
" 2. Straw and Grain, lbs.	2,880	2,560	2,160
Grain, bushels	65.9	54.1	40.0
" 3. Straw and Grain, lbs.	2,240	2,160	1,680
Grain, bushels	47.0	44.7	34.1
" 4. Straw and Grain, lbs.	1,840	2,480	1,600
Grain, bushels	21.2	37.6	16.4

The first report was of results on a swamp soil which produced very rank straw, and here both the potash and phosphoric acid produced good results. The next two reports show larger returns for potash alone than for potash and phosphoric acid, although it is hard to see why the latter substance should have injuriously affected the results. All of these experimenters reported that there was a marked difference in color and general appearance of the grain on the different plots, a difference so great that it could be seen as far as the plots could be distinguished.

EXPERIMENT III. This experiment was planned to ascertain the influence of lime on these soils, and was the same as No. II., with the exception that one plot received lime alone and that it was used also with the potash and phosphoric acid. The plots were, therefore, arranged as follows:

Plot No. 1.....2,400 pounds of lime per acre.
" 2.....2,400 " "
200 " muriate of potash per acre.
" 3.....2,400 " lime per acre.
200 " muriate of potash per acre.
400 " Thomas phosphate "
" 4.....No fertilizers.

The wet, cold weather of the early spring, and midsummer frosts were responsible for a large percentage of the failures. However, 10 out of 20 experimenters sent in complete results. These are as follows:

Yield per acre.	*Plot No. 1.*	*Plot No. 2.*	*Plot No. 3.*	*Plot No. 4.*
Report 1. Straw and Grain, lbs.	...	...	...	...
Grain, bushels	20.7	17.7	19.5	14.7
" 2. Straw and grain, lbs.	1,480	1,620	1,700	1,360
Grain, bushels	...	...	...	...
" 3. Straw and Grain, lbs.	4,600	5,160	5,120	4,120
Grain, bushels	...	...	...	...
" 4. Straw and Grain, lbs.	3,760	4,400	4,000	4,440
Grain, bushels	35.3	43.5	38.8	42.3
" 5. Straw and Grain, lbs.	...	...	...	...
Grain, bushels	13.0	13.0	19.0	10.0
" 6. Straw and Grain, lbs.		...	...	...
Grain, bushels	17.0	28.2	30.6	19.4

Report 7.	Straw and Grain, lbs	2,080	2,730	2,520	2,240
	Grain, bushels	23.5	26.0	24.7	23.5
" 8.	Straw and Grain, lbs.	2,960	3,240	2,520	1,640
	Grain, bushels	21.2	24.7	19.0	13.5
" 9.	Straw and Grain, lbs.	2,880	4,480	4,880	2,800
	Grain, bushels	30.8	44.7	47.0	25.9
" 10.	Straw and Grain, lbs.	2,160	2,320	2,240	...
	Grain, bushels	21.2	23.5	21.2	...

A study of the figures indicates that in the majority of cases lime gave decidely beneficial results, and that potash and phosphoric acid may be used on some of these soils to increase the yields. It should be borne in mind that these soils differ so widely, in composition, in stage of the decomposition of the organic matter, amount of mineral matter present, etc., that because one soil fails to respond to the use of lime of the fertilizers it is no reason why another should not. Furthermore, it may be pointed out that the full effects of the fertilizers will not be got the first year. Two hundred pounds of muriate of potash per acre for oats is about five times as much as will be taken from the soil by one crop, and in most cases the balance will be retained by the soil in a form readily available for succeeding crops. This is borne out by statements from experimenters to the effect that the appearance of the second crop on the fertilized ground was much superior to the rest of the field. In conclusion, I may say that we shall be glad to communicate with anyone having difficulty in securing paying crops on well drained swamp lands.

A Member: Were these plots tile drained?

Prof. Harcourt: No, I do not think any of them were drained. That has been the fault in some cases, for the soil was so new that the material leached out of it.

A Member: What effect do you think barnyard manure would have on these swamp soils?

Prof. Harcourt: We have not tried barnyard manure, but in correspondence with men who have swamp soils, I have found in a number of cases that they have used it with good effect. Barnyard manure is richer in nitrogenous matter than anything else. It seems like carrying coals to Newcastle, to put barnyard manure on swamp soils. It seems to me that the good effect that is got from barnyard manure is largely due to its containing germs that go with barnyard manure. Small dressings and frequent are better than large applications.

A Member: Last year, I experimented with phosphates on a barley field; the soil was thoroughly drained. It had no effect whatever.

Prof. Harcourt: In many cases, these swamp soils are deficient in potash, and until this is made good they are not productive.

FARMING WITH A DEFINITE OBJECT IN VIEW.

By Mr. G. A. Putnam, Superintendent of Farmers' Institutes, Toronto.

It is a great pleasure for me in my capacity of Superintendent of Farmers' Institutes, and also as an ex-student, to meet with the students and ex-students, and those who are connected with this Experimental Union as experimenters. I am sure it is a great pleasure to meet you here and to join with you in talking over the work of the past year and making plans for the future. There is just a danger that some of us might allow the pleasure of

the occasion to interfere with the profit. It really is a grand occasion for each of us to return here and meet with old friends, but we must not overlook the fact that it is a time when we can improve our agricultural information. We, who were students here some years ago are inclined to envy the students at the college at the present time. True, some of the old men, such as Mr. Zavitz and Mr. Mason, have won distinction along agricultural lines, but still I think some of us envy the students of the present day, who can claim they are of the body who have obtained some distinction in the judging contest in Chicago.

We might, at this time, ask ourselves what the Experimental Union means. It is an occasion when we meet together for the purpose of learning what has been done during the past year. I always like to meet with a student who has some one or more ideas which he intends to carry out, when he gets back to his farm. If you meet a student who says he has certain plans to carry out when he gets back on his farm, you can generally look to that student and find him attaining success when he goes back. I have in mind one student who, when he came here, was very deficient in education, and having no money of his own, he borrowed $50 in order to come to the College, and now he is getting $5,000 a year and his expenses, and the expenses not only of himself, but his wife and family. His success was due to the fact that he had one idea in mind, and he carried that idea through when he left the College.

It is a great pleasure for me, in going from place to place in the Province, to learn of the success which some of the ex-students have attained. I have in mind a student in Eastern Ontario, who, after he went home, adopted a very crude method of attempting to improve the average production of the cows in his herd, but at the end of ten or twelve years, working in co-operation with his father, he succeeded in increasing the average production of that herd 100 pounds of butter fat in a year, which would mean an increase of $900. He has not stopped at that, but says he can make an increase of 100 pounds more, and he is trying to do it.

I wish to ask the ex-students this morning, "What are you doing in your own locality or on your own farm?" There is no reason why every ex-student should not take a definite line of work. If there is not some definite line of work that you can take, what good was your course at the Agricultural College?

We have the regular Institute meetings, and the Special Fruit meetings, and the Dairymen's Association meetings, and there are any amount of opportunities through which you can do good work. I wish to impress upon you the advisability of undertaking some definite line of study after you go home. Form some kind of local organization. If you have no organization whereby you are able to follow up agricultural advantages, get to work and form a Farmers' Institute Club, or a Farmers' Institute whereby the farmers of the locality can come together and study. What can you hope to accomplish with an isolated meeting once a year? You must be able to apply general principles to local conditions, you cannot have one speech for all localities. We are planning in the Department of Agriculture to encourage the formation of Farmers' Institute Clubs. I secured the consent of the Minister a few days ago to give more encouragement to these clubs. These clubs, which hold at least four meetings a year, will be given a speaker upon whatever special line they want. That is in addition to the Institute meetings. It will be free of cost to that club, and if we have any literature in the Department, which is not in sufficient quantities to distribute to all, then these clubs will get the preference of this literature. I wish to warn you against despising the small Institute meeting, or the small Club. While

I enjoy meeting with the ex-students at the Union meeting, and while I enjoy meeting with the leading dairymen of the Province, at the annual meeting of the Dairymen's Association, I believe I have the greatest pleasure when visiting the small Institute meeting away off in the back districts. The other day I had the pleasure of visiting an Institute at Mono Mills, a place where they had never had an Institute meeting before. They organized a Farmers' Club there last winter. One of the leading men had attended an Institute meeting at Orangeville, and he went home and organized a Club, and they derived more benefit from that Club last year than the adjoining place derived from their regular Institute meetings in three or four years, and it was the most enjoyable Institute meeting I have ever visited. I mention these facts to encourage the students when they go back home, to form these local organizations. Where you have a Woman's Institute, have the women and the men hold joint meetings.

I trust you will take advantage of these few hints. When you go home, make an effort to form these Clubs or adopt some means whereby the farmers of the locality may have an opportunity of studying together and co-operating. (Applause.)

The CHAIRMAN: Mr. Putnam has thrown out some valuable hints and I think he struck the key-note of one of the present needs of Canadian agriculture when he spoke of the organization of Farmers' Clubs. I believe the most pressing need of the farmers of the whole of Canada to-day is organization, and I think there is a great work that may be done. These Farmers' Clubs will work out a great future for the farmers of Ontario.

REPORT ON FARM FORESTRY IN ONTARIO FOR 1907.

By E. J. ZAVITZ, Ontario Agricultural College, Guelph.

Owing to the long time element in growing and harvesting a forest crop, an annual report on the subject may bring forth little of new interest. It may be possible within a decade to entirely change the type of hog in the Province of Ontario, but the improvement of forest conditions must naturally take a longer period. We find that even in Germany where scientific forestry has been practiced for nearly two hundred years, that to-day the private woodland is often badly managed. I venture to state that in Ontario the percentage of badly managed woodlots is not so much greater than the percentage of mismanaged farms.

Co-operative Planting.

This last season has been especially severe on forest plantations. A late season with strong, cold winds followed by an extremely dry summer will probably result in some failures. On the poorer classes of soil the Scotch Pine and Black Locust have shown the best results. About two hundred thousand plants have been sent out this last spring, composed chiefly of White Pine, Scotch Pine, Jack Pine, Norway Spruce, and Black Locust. The department is prepared to make planting plans and furnish planting material free to parties having waste lands; the applicant paying cost of transportation of trees and doing the actual work of planting. For planting in spring of 1909, applications should be in before 15th of June, 1908. In this way officers of the department may be able to organize their trips into each district.

There has been in the last ten years a large decrease in the acreage of woodland in the old part of the Province. The following table has been compiled from the report of the Bureau of Industries, and does not include the newer districts opened for settlement in Algoma and Nipissing:

—	Sq. miles of land assessed.	Sq. miles of cleared land.	Sq. miles of woodland.	Sq. miles of slashland.	Sq. miles of swamp and waste.
1894	34,788	19,089	11,348	.....	4,349
1905	36,288	21,620	7,634	2,779	4,257

The indications are that an increasing number of woodland owners are giving this question some consideration, but the proportion of woodland will likely decrease much further. Wood prices are such that there is a great inducement to overcut. Elm, Soft Maple, and other one-time inferior trees to-day bring a good price at the local mills, and this price is gradually increasing.

In order to keep up the proportion of woodland in Southern Ontario, we have the opportunity of re-planting waste lands. We have in old Ontario two forms of waste land. The small area on the individual farm which is untillable and may be in the form of steep hillsides, sandy or gravelly ridges, etc. We also have throughout older Ontario large areas of waste lands ranging from 1,000 acres to 60 square miles, which are not being farmed or improved in any way. In some cases this land has been cleared and cultivated, but abandoned. There is, in the southwestern peninsula of Ontario—that area lying west of a line from Toronto to Lake Simcoe—about two hundred square miles of this second class of waste land. The waste land in small parcels on the farms of the Province can only be improved by the individual owners, although the state can assist and co-operate, as is being done.

This other problem of re-foresting the large areas is confronting us. Why should we worry about it and what can we do? Re-foresting these lands would give protection to neighboring lands and to small streams having their source therein. It should also give a revenue to the local municipality where at present such lands are a burden in many ways.

Forestry management of these lands would supply work and raw material for local people and industries. Such management would also protect the ignorant settler from being persuaded into a farming experiment on such land. Lastly, it can be shown that forestry on such soils is a good investment, especially for the state.

To give some idea of forest planting as an investment, the following may be of interest:

One of the most promising trees for waste sand types of soil is the Black Locust. It seems to withstand adverse conditions and should be of special interest for waste land propositions. Very extensive work has been done in Hungary with this tree, where it is estimated that they have about 200,000 acres of pure Locust forest in the form of plantations. The Agricultural Department encourages tree planting, and sends out every year from five to six million Locust seedlings. This planting is done on soils which are absolutely worthless for agriculture, and the following table gives results from some of the earlier plantations:—

STAND OF LOCUST ON SAMPLE PLOTS OF ONE ACRE.

Plot.	Soil, quality.	Age, years.	Number of trees.	Average diameter, breast high.	Average height.
Seedlings.				inches.	feet.
a	Good.	30	558	5.3	63
b	Best.	31	512	7.5	60
c	Fair.	30	594	4.3	38
d	Poor.	30	288	3.0	20
Second-growth					
e	Fair.	8	452	3.3	30
f	Good.	15	643	4.3	47
g	Fair.	15	391	3.7	33
h	Poor.	15	324	2.3	20

These figures are for a district where the annual rainfall averages 21 inches, and the temperature ranges from zero in winter to 95 degrees Fahr. in summer. This district is very similar to Southern Ontario, and the figures are of more value to us than any results obtained in the middle western States where planting has been done on good soils.

The first table where plots are of seedling origin, are 30 years old and would average 488 trees 5 inches in diameter and 45 feet high, estimating two fence posts to the tree we would have 976 posts at 20c. a post, which would give an annual gross revenue of about $6.50, and this on non-agricultural soil.

The second table which represents second-growth of coppice, meaning the sprout growth coming up from the stump after cutting, shows better results than the seedling plots.

The fact that this growth can be had on poor soil in from 15 to 30 years, makes this tree of value to the farmer. Black Locust at this age is chiefly of use for posts, vine stakes, poles, fuel and general farm work.

The proper management of these waste land areas in the agricultural part of the Province is of direct interest to the farming community, and I feel that the solution is of vital interest to such an organization as the Experimental Union. What good has been accomplished in this Province along the lines of reforestation, is largely due to earlier efforts of this Union. The work has only had a beginning and this organization can do much to further the cause of reforestation.

Mr. GROH: I have done a little work along this line. On the farm upon which I live I built a barn, and, some years later I learned that the trees with which I built the barn, had grown on that farm during the lifetime of the gentleman, who formerly lived on the farm. The old gentleman stood at the back of the barn, and told me how a fire had swept across the woods, and burnt up everything clean. I said to him, "You do not mean to say that these big pines on the hill have grown up since?" and he said: "Every one of them." I said: "Surely you do not mean these big pines?" and he said: "Every tree was burned away." I built that barn in 1887, and, the trees have grown since 1804. I can think of another point Mr. Zavitz made when he spoke of wood lands. On another farm I purchased recently I find that if we cut out such trees as we really despise in the bush, the beech and such like, there would be very little wood left. I turned the cattle out of the woods, and I planted trees, and we have trees now reaching from 18 inches to 4 and 5 feet, and I think it is now time to cut down the weeds and

give the trees a chance. A great deal can be done to re-forest your wood lands. The young trees grow slower on the sod, than they do where they are protected.

Two years ago I started under the direction of Mr. Zavitz to plant trees on the hill-side, and last year we had very good success. This year the drought struck us and we were not quite so encouraged. Our successes have come from simply following instructions. Our failures often teach us much, and, I think that we learned more by the failures of this season than we learned by the comparative successes of a year ago. I think our future is more sure after a failure than it was before. Lands and hill-sides that are now eye-sores can be made beautiful and profitable by planting them to trees. I often wonder when I see the hill-sides all naked and bare why they were ever cut down; they are of no value for cultivation. We have these hills all about us, and we have started in the work or re-clothing them, and believe it is going to be successful. The little pines planted a year ago have made a growth of 8 inches. Some of these trees were planted in a lucerne field, and when we planted the little pines about the size of a strawberry, and expected them to grow through lucerne, we expected a lot, and, yet we find they are doing it. Last year we had an extremely dry season, and we feel that we must give them a better chance.

While I may not live to build another barn from trees of my own planting, my children may be able to do so, and, my boys may grow up to say, "Father planted these trees," and, may be the old man can go around on a crutch and say, "I planted these trees," and it will be something to say if we can see trees 40 and 50 feet high on hill-sides, that we planted with our own hands. I believe it is a thing to think about, that should not be lightly cast away. They say you will be an old man before you will get anything out of this; but I have always said, that as soon as I know they are established and growing, I will consider they are worth hundreds of dollars.

I am not going to wait, because I am not going to use all that is in this world, before I go. I am going to leave something behind, and I would just as soon leave some pine trees growing as a bank account. I do not know that I will be praised more by having a bank account to leave behind, than to have a large bank covered with pine trees. If you do not succeed the first time plant them again. Mr. Zavitz will help you along with the work, and, if you are quite green in the work, he is not afraid to take off his own coat and help you to do it. (Applause).

THE CHAIRMAN: Mr. Groh's enthusiasm in this matter makes me think of the statement made by an old man to his son: "My son, when you have nothing else to do, plant a tree." That is good advice.

RESULTS OF CO-OPERATIVE EXPERIMENTS IN APICULTURE.

BY R. F. HOLTERMANN, BRANTFORD.

At the last annual meeting of the Experimental Union a committee on apicultural experiments was appointed. It was decided by this committee to carry on some co-operative experiments, and one was in connection with the amount of formic acid in honey in various conditions;—for instance, to make a chemical analysis of the amount of formic acid in honey when it was first started in the honey comb. That has been only partially arrived at. That is what we call green honey; then to leave it in the hive to see if there

was any variation in the amount of formic acid in the honey. Another line of experimental work was to test the difference in the honey made by the common black and the Italian bees.

I may say that an announcement was made through the members of the Association, and also at some Bee-keepers' Conventions in the United States, and the response and interest taken was very satisfactory. We have one experimenter as far away as California. I sent to Prof. Harcourt a sample of some peculiar honey, and asked him to test it as to the amount of formic acid in that honey, and in his reply he said if any fermentation had taken place in the sugar, that would have to be deducted for the amount of formic acid. You will see that this opened up a difficulty in determining the percentage of formic acid in the honey. If the honey is taken from the hive, and the weather is warm, it is likely to ferment at a very early stage, and I saw then that we were up against a difficulty, and that our work would be misleading and valueless unless we were very careful.

Work of this kind has to be done in the slack season. I am wintering 374 stocks of bees, and the system which I pursue of moving about from one post to another makes the season a very busy one for me, and it is utterly impossible for me to pay very much attention to that kind of work during the busy season. My plans have been laid to do the work before the busy season, so that if each member would simply carry out his instructions and send his samples to Prof. Harcourt, he would be able to go on with the experiment. The experimenters were willing to go on with the work, but I considered that it would be unwise to go on with the experiment until we could overcome the difficulty. Prof. Harcourt says that we can overcome the difficulty by putting into the nectar, which is really thin honey, something which will prevent fermentation.

We hope that if this work is continued, that in the coming years, we will be able to have something definite. The work has to be done carefully. The first co-operative work was done in 1898, to determine the specific gravity of honey. The object of that was to prevent any honey being put upon the market unless it had reached a certain stage of ripeness. In the United States, they have a law prohibiting the sale of unripe honey.

We had a little expense in postage in connection with this work, but it was not worth while sending it in. We hope we will be allowed to act again, and that next year we will have something definite to show as to the result of the work we have done.

LEGISLATIVE CONTROL OF FEEDING-STUFFS.

By W. P. Gamble, Agricultural College, Guelph.

The subject of "Legislative Control of Feeding-Stuffs" has received considerable attention from this Association in the years gone by. For the benefit of those who are not conversant with what has been done, I would like to state, first, the reasons why this Association thought some action should be taken in the matter; and, secondly, state in brief what steps have been taken by the Association.

Most farmers have not the time to carry on any extensive series of experiments, and even if they did so, might arrive at erroneous conclusions. It is well known that feeders of live stock are frequently persuaded by plausable salesmen to purchase worthless feeds, and, as a consequence, lose or

waste their hard earned cash. The experiments which they carry on are usually isolated, and isolated feeding trials are often misleading. For example, a feeder purchases a low grade stuff which he feeds to a particularly thrifty bunch of steers. The hay, ensilage, roots, etc., which comprise the major portion of the ration, are of particularly good quality. What is the result? We are told that the splendid gains made by the animals are attributable to the purchased feed. Mr. A. says such and such a feed did so and so, and thus the material is advertised.

Again, it is a matter of common knowledge that commercial feeds have received extensive advertisement from the fact that the first lots put upon the market are really good, in some cases considerably above standard. When, however, a demand has been created, the quality drops off and the manufacturer makes his money on the lower grade material.

Besides the variation in composition in the feeds as sent out from the factory, there is also the danger of adulteration by the dealer. The Experimental Union, in 1903, feeling in a vague way that much injustice and imposition were being done the farmers of the province, through the sale of inferior and adulterated feeding stuffs, passed a resolution that a petition, signed by the members present, be sent to the Minister of Inland Revenue asking that limits of variation be fixed for the main constituents of commercial feed stuffs. The petition was forwarded in due course and acknowledged by the Department, but no further action resulted. During 1904, attention having been thus called to the subject, the members of the Union spent considerable thought and observation upon it and were so fully convinced that their previous stand was a correct one, that at the annual meeting the matter was again brought up and the same action taken as in 1903. As a result of this petition, the Minister of Inland Revenue called a meeting at Ottawa on June 6th, 1905, at which there were present the Deputy Minister of Inland Revenue, Mr. W. J. Gerald; Prof. Shutt, Chief Chemist, Dominion Experimental Farm, Ottawa: the late Thos. McFarlane, then Chief Chemist of the Department of Inland Revenue; and Mr. W. P. Gamble, Assistant Chemist, Ontario Agricultural College. This committee, after full consideration of the subject, came to the conclusion; (1) that it was impracticable to fix standards; (2) that extensive collections of these feeding stuffs should be made, the samples analysed, and the results published in bulletin form.

These conclusions, which eventually took the form of recommendations, were presented at the annual meeting of the Union in December of 1905, and adopted. The published analyses of the samples collected showed that the fears entertained by members of the Union were well grounded, that the feeding stuffs varied greatly in quality, and that many of the brans were largely adulterated, and that their feeding value bore no relation whatever, to their prices. At the annual meeting last year these analyses and conclusions were presented, and a resolution was passed which advised as follows:

(1) That each package of commercial feed stuff should be labelled with the percentage of protein and fat contained therein;

(2) That the term bran should be legally defined;

(3) That copies of the resolution should be sent to Farmers' Institute meetings to be signed by the members, and that, when signed, they be forwarded to the Minister of Inland Revenue and construed as a petition asking for the labelling of packages and the definition of the term bran.

These petitions which were largely signed were in due course transmitted to the Department of Inland Revenue. A short time ago I wrote Mr. Gerald, Deputy Minister of Inland Revenue, asking what action had been

taken or was in contemplation. In his answer he states, that the matter is receiving the consideration of the Honorable the Ministers of Agriculture and of Inland Revenue, but just what action was in contemplation he was unable to say.

It seems to me that it would be well for us to again bring the matter to the attention of the Government. I would, therefore, move the following resolution:

"That this meeting approve of the action taken at last year's annual meeting, and that we again urge upon the Honorable the Minister of Inland Revenue the desirability of a law enacted on the lines of last year's resolution.

"2. That if necessary a delegation be sent to Ottawa to urge upon the Government the necessity of Legislative control.

THE PRESIDENT: This is a subject which we might discuss for some time with profit.

W. S. FRASER: I am very pleased to hear the report of Mr. Gamble. I think it touches a point that has not been fully enough dealt with in the past. The adulteration of food is illegal, with regard to what men are supplied with, but animals consume far more food and are not protected. In protecting animals, we are protecting ourselves. Adulteration has been carried on to such an extent that it is time that something was done to prevent it. I have found that bran was adulterated not only with oat hulls, but also noxious weed seeds. We found this in a sample that was taken from one of the Ontario mills. A miller, of good standing, stated that he was offered carloads of this weed seed material from the screenings of the elevators at Fort William and Port Arthur at a low rate, and he was told how to make money out of it by mixing it with corn or barley. Throughout the country, we have seen oat-hulls served up with corn and barley meal. There is certainly some corn and some barley, but there is also a large quantity of oat-hulls. The ordinary farmer sells all his good grain in the fall and in the spring pays a greater sum per ton for this stuff that is a very inferior kind of food, and feeds it to his stock, and is disappointed with the results.

Now, with regard to the adulteration, not only this stuff, which is useless, is put in, but weed seeds are put in also. I am very pleased to second Mr. Gamble's motion. I hope the matter will be discussed fully and that it will be pushed until there is something done to prevent the injury that is being done by selling feed that is of very inferior quality, and also to prevent the introduction of the vilest weed seeds in this country, under the name of food. A gentleman appeared before the Seed Commission, and took his oath that the Government were doing wrong in calling them noxious weeds. He said they possessed medicinal values, and that some of them were worth fifty cents for half an ounce. And he took credit to himself that he was the first to inaugurate the dealing in weed seeds from these elevators.

MR. MASON: This is certainly a matter of very grave importance to the farmers of the province of Ontario. Ontario is particularly a manufacturing province from an agricultural point of view. We can bring the products of our own farms into a higher and better quality of food, and we can also make use of a great deal of the bran, and shorts and imported grains from the West, and I think I am within the mark when I say that millions of dollars worth of these products are used annually in this province. It touches closely the pocket of every Ontario farmer and feeder. I think it is only by constant pounding away on this question that we are

going to get anything done, and I am very much in favor of keeping up this until we do succeed in getting something done along these lines.

Mr. Freeland: In our section, we have had feed brought in and offered for sale cheaper than good sound grain of our own growing can be bought for, and many farmers bought this grain and were disappointed in the results. I believe it was filled up largely with weed seeds, ground finely and mixed in with it and the purchasers were the losers.

Mr. Hallman: I think it is very important that something should be done. In our own community, we feed largely home-grown feed from our own mills, and we are not bothered so much with noxious weeds. I think, however, it is very important that this resolution that has been presented, and seconded so ably by Mr. Fraser, should be put into action, and I heartily endorse everything that has been said this afternoon.

The Chairman: I believe one of my own college chums, who is now an extensive farmer near Beamsville, has purchased extensively of this kind of stuff.

Mr. Gunn: I have not considered the matter sufficiently to put it before you in proper and concise form. The first two years of my experience in farming I kept a large number of horses, and consequently purchased a large quantity of bran. For the first two years, I was able to purchase Ontario bran from our own millers, but of late yaers I have been forced to fall back upon Western bran. I purchased it in lots of five to ten tons, sometimes taking half a car load, and the last two years I have noticed the bran from the West to be inferior. The horses will eat their food and in the bottom of the manger you will be able to pick up about half a handful of noxious weed seeds, and in these mixed weed seeds there were some which I could recognize, but a great many which I could not. These weeds are a great detriment to our Ontario farms. If we Ontario farmers are to allow our millers to procure bran from the West and put into it screenings, that they cannot sell for more than six dollars a ton, and sell it to us for $24 a ton, I think it is too bad. One particular lot of bran from which I have been feeding recently has material in it which has the greatest resemblance to saw-dust of any substance it has ever been my displeasure to meet. I know that a number of my horses, when I have mixed up a mash of this bran and placed it before them, will not take it. If we have to pay the price we have had to lately, and then get rubbish like that, and can get no protection, I think the country has come to a pretty pass; and our men at Ottawa evidently must have other interests at heart than the interests of the agriculturists when they do not put their foot down upon the distribution of this rubbish, and especially the selling of it in this country as bran. (Applause).

Prof. Zavitz: This matter has come before the Experimental Union for three or four years, and there has been no uncertain sound at each one of these meetings. A committee was appointed sometime ago, and a chemical investigation was carried on here at the College and numerous chemical analyses showed that there was a great need for some method of regulating the food stuffs for Ontario. I believe before long there will be some regulations with regard to this matter. A large number of the Farmers' Institute officers and members took up the question last year, and I had hoped there would be some Dominion regulations before this time. There are none as yet, but I think if we stick to it, we will get the regulations before very long. I am glad there is no uncertain sound with regard to this question.

Mr. Putnam: As superintendent of the Farmers' Institutes, I was pleased to send out last winter, copies of the resolution which was passed here,

together with some statements gotten up by your committee, and they were signed by a great many of those in attendance at the Farmers' Institute meetings. I am not certain how many of them we sent to Ottawa, I think it was about 2,500, and they were representatives of nearly every county in the province.

Mr. Fraser has referred to the meeting which we have had in Toronto. It was quite a revelation to me to find the great variation there was in the food stuffs which are offered at the same price. Some of these food stuffs which are offered by local millers are well worth the money you pay for them, and other stuffs which the millers are able to put up so they can have the same appearance are not worth one-third what you pay for them. Mr. W. J. Clark gave us some startling facts before the Commission, and it seems to me that if some action is not taken, the farmers of this country will suffer very materially.

Both motions were put to the meeting, and they were carried unanimously.

THE CHAIRMAN: Would it be in order to appoint that delegation?

Prof. ZAVITZ: I should think that it would be quite in order, and that it would be a very wise move. For the last two or three years there has been a committee; the members of that committee would form a good delegation to go to Ottawa. The members of the committee are the Hon. Mr. Monteith, Mr. Gamble, and Mr. Mason.

Mr. GRASSER: While dealing with this matter, I think it would be well to include other foods than bran. The discussion seems to have concentrated on bran. There are mixtures of screenings and other stuffs which contain a large amount of adulteration and many of these weeds are prominent.

Mr. GAMBLE: In last year's resolution the other products were included and enumerated, and the petition asked that the percentage of protein and fat should be given and that the manufacturers should give a guarantee of the same. Bran and shorts were not included. Whole grains and meals obtained from the grinding of any single grain were also exempt in these resolutions. All other material such as, oat-hulls, pea meal, and pea bran, and so on, were included.

Mr. FRASER: Do I understand you intend to include bran, shorts and such like at this time?

Mr. GAMBLE: These, we exempted, that is to say, we do not ask the manufacturers or dealers to give a guarantee of the percentage of protein and fat in them; they were only required to keep out of them all foreign substances. We obtained a sample of weed seed ground by a milling company of Port Arthur, and we made particular analysis of this. Mr. Graham obtained a large quantity and fed it to his chickens, and as a result of his feed trials, he found this meal was not suitable for poultry food.

Mr. FRAZER: If he had continued it for another week his chickens would have been dead.

THE CHAIRMAN: The members of this committee are the Hon. Mr. Monteith, Mr. T. H. Mason, and Mr. Gamble, and I will ask you if it is your wish that these men should form a delegation to represent the Union at Ottawa, to urge upon the Minister of Inland Revenue the great need of legislative control of feed stuffs, and to insist on protecting Ontario farmers along the line set forth in the resolutions.

Hon. Mr. MONTEITH: I would ask to have some one substituted for myself, as I think you could choose from the ex-student body some one to take my place to better advantage, as my many duties might not permit me to accompany the delegation to Ottawa.

It was moved by Mr. Kewley, seconded and carried, that in addition to the committee above mentioned, the name of Mr. N. F. Wilson, M.P., be added.

Moved by Mr. Gamble and seconded by Mr. McRea, that Mr. C. A. Zavitz be added to the committee. (Carried).

Mr. FRASER: I hope that Mr. Monteith will be there at the head of that committee as his presence will have greater effect than any of the others.

THE FUTURE DEVELOPMENT OF THE FIELD CROPS COMPETITION IN ONTARIO.

By T. G. RAYNOR, Seed Branch, Dept. of Agriculture, Ottawa.

It has been the part of wisdom to give a good deal of attention for a number of years to the improvement of our live stock interests. Another interest which goes hand in hand with our live stock is our field crop interests. Until recent years the general farming public have not been aroused very much on this important question. Perhaps no factor has played such an important part in this work as our own Experimental Union under the wise and efficient direction of our zealous Secretary, Prof. Zavitz, and his zealous corps of helpers. They have successfully carried out the College extension work in farm crops, about which there is a good deal being said and written these days. It was perhaps the burning question in one form or another up for discussion at the recent American Association of Farmers' Institute workers' convention held at Washington.

When we realize that about 10,000,000 acres of this fertile Province is under cultivation and that of this amount one-half is sown with cereals and the other half is into meadow and hoe crops, we can perhaps get a little idea of the importance of our crops. If the productive capacity of these 10,000,000 acres could be increased, even one bushel per acre, it would mean a much increased revenue to our country. I believe it can be increased much more than this.

Prof. Zavitz is authority for saying that our field crops have a value of $135,000,000 per annum. The Provincial Department devotes about $70,000 per year to aid agricultural societies. Of this amount, how much has been given to promote the production of seed grain, even in the way of prizes at the fall exhibitions? In looking over the various prize lists, we are free to confess it has been comparatively little. In fact, we have to look in vain for any great improvement in our farm crops through this source. Perhaps it has been partly due to too many irregularities having been countenanced in the exhibits themselves. If there is any space left at the exhibition, you will find the grain and vegetables crowded together there, often without very much arrangement, and certainly with very little information regarding them.

The small quantity of seed required to be shown has enabled the manipulator, if at all inclined to be dishonest, to make his conscience so elastic that by picking over his seed grain carefully he could make it serve not only for several shows the same year, but many of those shows for a series of years until it becomes a standing joke, too practical to be tolerated any longer. Anyone who has judged the seed grain for one society three or four years in succession will know the truth of what I am saying. We have given the fall exhibition a fair trial and it has in a measure failed in improving the crop of the country very much.

Some years ago Mr. Hutchison, of the Exhibition Branch, urged upon the Hon. Minister of Agriculture, Mr. Fisher, the advisability of securing lands in the west and equipping them with help enough to grow seed grain for distribution to the farmers. Dr. J. W. Robertson, while in the Department of Agriculture, talked of establishing illustrative stations, partly to promote this line of work. These ideas were objected to on the ground it might interfere with the individual enterprise. It was then that Mr. G. H. Clark, the Seed Commissioner, suggested to the Minister that the holding of competitions in fields of standing grain might help the farmers to help themselves. In 1906, through the co-operation of the Provincial Departments of Agriculture for Alberta and Saskatchewan, the competitions were tried and proved successful. This season, through the Seed Branch co-operating with the Superintendent of Agricultural Societies for Ontario, eleven such competitions were held in this Province. They proved in a measure to be successful, and I believe that there has been no forward movement in field agriculture of recent years which is calculated to encourage the production of high class seed more than this one. It is wide in its application; it may extend to all field crops, and there is no reason it should not be extended to the pasture crops as well. Its advantage over the fall exhibitions is that the judge may be sure the crops he is judging are this season's growth. These crops represent (for there were 5 acre plots) a considerable quantity of seed which may become available for seeding purposes, and this fits in with the seed fairs which are held during the winter and spring. It will encourage the use of a regular rotation of cropping, clean farming, selection of varieties, better use of fanning mill in selection, better cultural methods, the intelligent use of fertilizers, and will encourage improvement in field crops by the hand selection of individual plants. It should be one of the most convincing arguments that the plans adopted by the Canadian Growers' Association for the improvement of crops are along right lines and should engage the competitors serious attention. To me the plan has a great future before it. Not only will it improve all these crops which are growing in this province as cereals, but as Prof. Zavitz has remarked, why may it not be extended even to the encouragement of our pastures? If it will increase the average productiveness per acre in grain, why will it not stimulate more attention being paid to our pasture mixtures, both as temporary and permanent pastures? Not enough attention has been paid to our pastures, which are every year increasing in area and playing a more important part in our farming operations.

Other lines of useful work which the field competitions might stimulate are the local shows where the competitions are held. As each competitor is a member of his agricultural society, he could contribute greatly to his fall fair by bringing a sheaf of his best production and a sample of his grain. He could give such information perhaps as the variety and yield per acre, the amount he has for sale and his price.

At our provincial winter fairs, the best of all the Province, as decided upon by the judges might be brought together to compete for a sweepstake prize. Such a display would be an education in itself, and would give the successful competitor a very enviable reputation in which he might honestly trade. It will furnish our wholesale and retail men with the information they require as to where suitable stock may be found for their trade.

The CHAIRMAN: I am pleased to introduce Mr. Nicholson, who has put into practical use on his farm what he learned at the College, as I understand that he secured first prize in the field competition. He is also a successful experimenter in connection with the Experimental Union.

Mr. C. NICHOLSON: I was very much interested in Mr. Raynor's address, probably owing to the fact that I was one of the warriors who was in the competition last season. Our field crops are receiving more attention than they have in the past. Our live stock has had more encouragement than has our field crops. On looking over the census of the country a few days ago, I noticed that the value of the field crops was $18,000,000 more than the value of all the other farm products put together. There has been considerable encouragement given to the introduction of new varieties of grain, grasses and roots and to the testing of them. The Experimental Union has sent out the leading varieties to all parts of the Province. The Canadian Seed Growers' Association commenced the work of improving our best varieties and outside of these agencies, we have not had very much encouragement to improve our field crops. Of course in the improvement of our live stock, our field crops have been improved indirectly, because it is the increase in the fertility of the soil that also helps to produce good crops. We must not forget, however, that our field crops are of primary importance, and that we should aim to continue the growing of better crops. I believe, in the next twelve years, we will be able to increase the value of our farm products by a hundred per cent., as has been done in the past twelve years, by better methods of farming. There is scarcely a farm in the Province that does not need more tile-draining. I consider that tile draining is a basis of good farming. If we have a well-drained farm, we are in a position to adopt a good rotation of crops, in which we can introduce clover and hay crops—clover to enrich the soil and to smother the weeds, and the hay crop to clean the land.

Regarding my own experience with the crop with which I took the first prize in 1907, I can say that five years ago, the land on which the crop grew was the poorest land which we had on the farm, but by tile-draining and a short rotation of crops, we have put the field in such a shape that it will produce a crop that will compare favorably with any crop grown in that section last year. There is room for these field crop competitions in every part of the Province. (Applause.)

The CHAIRMAN: It is certainly pleasant to note that the ex-students of the College are capable of farming in such a way as to take the prizes for having the best field crops grown in the district.

A MEMBER: Are these competitions in connection with the Agricultural College?

Mr. RAYNOR: Altogether through the Agricultural Societies of Ontario. Mr. Wilson, Superintendent of Agricultural Societies for Ontario and the Seed Branch at Ottawa, have been working together during the last year. The Provincial Department made all arrangements with the local Society for carrying on the competitions and for providing prize money, and we furnished the judges and paid all expenses of doing that work. Mr. Nicholson said it would encourage rotation of crops. We found in connection with our work that there was scarcely a man in the whole lot that did not have a different system of rotation of crops from all the others. Those who worked to the plan of a short rotation, had fewer weeds on their farms. We inquired where they got their seed, and in almost every case they obtained it from some enterprising farmer who had taken up the work through the Experimental Union. There were a good many different varieties, and I believe these field competitions will do away with that, and it will supply the market with a cleaner supply of seed. Our seed law is having some effect upon the country, and it is bound to widen its influence. I see a bright future for the farmers of this country, and I believe the wholesale seed houses and the local seed houses will be looking to our best farmers for their supply of seed.

COMPETITIONS WITH FIELD CROPS.

By J. Lockie Wilson, Superintendent of Agricultural Societies, Toronto.

I am very much pleased indeed to have the opportunity of meeting the members of the Experimental Union, and to listen for a short time this afternoon to the able addresses that have been delivered. This is the first time that I have had an opportunity of speaking to the large body of students of the Agricultural College of Ontario, and I can assure you that it is a very great pleasure indeed for me to be here and see you in this magnificent hall. I, with a number of perhaps the fathers of the sons who are here, had something to do with the building of this hall. A number of years ago, we put up a protest against so many of our wealthy men spending their money in the great cities, and I was on a delegation of farmers that waited on Mr. Massey, and invited him down to this place, and during the course of conversation in his office, I intimated to him that it would be a very fine thing for the farmer boys of this Province, whose fathers are doing so much for agriculture, if he would build a hall of some kind at the Ontario Agricultural College grounds, and Mr. Massey said he would consider the matter. And evidently it was considered by him, and the result of the work of that distant day may have had some effect in assisting you in having this magnificent hall erected here. I am glad to know of the great work that is being done. I am not a member of the Union. Living in the most easterly county of the Province, we largely engage in the production of cattle for dairy purposes; but we have watched your work, and many of us have taken a leaf out of your book, and have been able to increase the production of our farms. Science and farming must go hand in hand. A great work devolves upon the students of this College and the members of the Experimental Union. The work before you is one that can scarcely be grappled with. I do not know of any other work that is of more importance to the farmers of this country, and to the citizens of this country, than the work you are engaged in. A short time ago, the book-farmer and the College student were looked upon as being of very little account; but that day has passed, and we come to the stage where men in all departments of agriculture recognize that agriculture is a great profession after all, and that the agriculturist requires more brain power and a more active mind than any of the other so-called learned professions, and in the near future agriculture will stand at the head of the learned professions. The legal profession, the medical profession, and the theologian or scientist will not stand higher than the agriculturist. Men are beginning to know the great possibilities of it, and in the department of which I have charge, these field competitions are being taken up with energy. It was late in the season before we had our arrangements made. We were at a loss to know how we should deal with the four or five hundred societies of this Province, and we decided the better way would be to allow the first ten societies which applied to hold the competition. We sent our circulars to every society in the Province and stated that the first ten societies complying with the rules would be the ones that would be accepted. Almost before the ink was dry on our circulars, we had the number we required over-run many times. We took out the first ten and the work went on, and Mr. Raynor has told you of the results. They have had a great effect on the farmers of the Province. This coming year we propose going a little further. I have a scheme on foot, and I had communication with Mr. Clark. He is willing to co-operate with us heartily in the furthering of this great work, and his department is willing to supply the judges,—and I must bear testimony to

the excellency of the men sent by the Seed department last year. No complaints have come to the department that there was the slightest unfairness. I have not yet brought the matter before Hon. Mr. Monteith, but last year he gave us a special grant of $1,000 for the field crop competition, and this year we are going to ask for more, although I cannot name the amount; but I am sure the amount I ask for will be given heartily by the Department. I propose that we divide the Province into two sections, the Eastern and the Western, and divide the amount we expect to get equally between these two sections. And we think a fair way would be to take ten societies east and ten west of Toronto which have given the most money for agricultural purposes, as laid down in the Agricultural Societies' Act. If any gentlemen have any suggestions to make along this line, or in connection with any part of the department over which I have charge, I would be glad at any time to receive advice, and to consult with you at all times. I would be glad to get in touch with the students of your Agricultural College, as I am with many of the professors of your College, and with the officers of the Horticultural Societies of the Province ,and the officers of the Fall and Spring Fairs, and our Seed Fairs. I think these are strengthening organizations that will produce, as the years go by, good results, and will prove of great benefit to this country of ours. (Applause.)

PROGRESS OF THE ONTARIO AGRICULTURAL COLLEGE.

By President G. C. Creelman, O.A.C., Guelph.

On this particular occasion it has been the custom for the President of the College to say, just at this time each year, some things in reference to the progress of the institution, and in order not to break that time-honored custom, and for that reason only, I accept the programme which has been put in my hands, and shall say some things which may be of interest, particularly to our ex-students and visiting friends.

A College is very much like an insurance business, for an insurance agent is expected not only to do as much business as he did the year before, but to show some growth as well. So a College, if it will keep up its good work from year to year, must show substantial growth all along the line. In many phases of our work this is hardly appreciable—hardly to be appreciated by the ordinary person, hardly to be appreciated always by students in the several classes. By that I mean, there is some work that does not show up as much in colleges as in other places. For instance, the President of an institution of this kind is brought very much farther forward in the public light than he oftentimes would care to be; he often finds his photograph coming out in the papers; he finds himself pushed forward not only at agricultural gatherings, but at other times when he would much prefer that someone else could take the part. They could in many instances do it much better, but many things are said about him that are meant to be said about the institution. If anything happens in connection with the institution upon which it is to be congratulated, the President of the institution gets the telegrams; whereas there are many people more obscure,—lecturers and demonstrators who scarcely come forward at all, and whose names are not known to many of you, except to those who actually come in contact with them—men who are doing the actual work referred to, who are making for the College students, and giving students an opportunity to make of themselves men who are going to be a credit to this institution—and yet their work is hardly noticed at all.

It is on behalf of those, from the lowest demonstrator to the most prominent of the professors, that I want to pay tribute to-night to a large extent for the success of the work during the past twelve months.

Without a student body, of course, we could not accomplish very much here. With reference to the boys, I have only to say to-night, they are here and will speak for themselves. They are here in increasingly large numbers. We have a total enrollment in all classes, short courses and others, of 1,077 different individual students during the past twelve months. That is a record, so far as attendance is concerned. This number is made up of students in our general course or long course in agriculture of 358; students taking irregular work in agriculture, 18; students specializing in manual training alone, 29; in the dairy courses, 63; in short courses, stock and seed judging, 302; in poultry, 24; in Domestic Science, 243; and Nature Study students, 40, making a total enrollment of 1,077 students since the first of January, 1907. These students come, as most of you know, from all over the world. This year our enrollment has not differed very materially from the enrollment of other years, but it may be interesting to some of you if I briefly state just where our students came from this year, the great majority, of course, coming from the Province of Ontario. Outside of that, Alberta, 5; British Columbia, 12; Manitoba, 3; New Brunswick, 4; Nova Scotia, 13; Prince Edward Island, 2; Quebec, 7; Saskatchewan, 3, every Province represented. Then in alphabetical order from other countries:

Argentine Rep.	8	Japan	3
Belgium	1	Jamaica	2
England	29	Mexico	1
Egypt	1	Scotland	8
France	1	S. Africa	1
Germany	1	Spain	2
Ireland	3	U. S. A.	23
India	2		

In regard to staff changes I would like to say just here, that as in former years we deplore the loss of members of our faculty from among the officers. It seems impossible, in a large Institution of this kind, to have a year go by without some changes having taken place. This year I may mention in particular that we lost Miss Rowsome, our teacher in French and German and Librarian, who has gone to Macdonald College, near Montreal. Her place has been taken by Miss Dwight, whom we have with us. Miss Bigelow left us to go to St. Anne's, and her place was filled by Miss Irene Allen. Mr. H. S. Peart was promoted to the new fruit farm which has come into possession of the Province of Ontario within the last year, and his work here is taken up by Mr. J. W. Crowe. Mr. H. S. Arkell, lecturer in Animal Husbandry, left us to go to Macdonald College, and we were fortunate in securing from Arkansas, one of our own graduates in the person of R. W. Wade. Mr. H. G. Bell, of the Experimental department, was called away to Iowa at a larger salary, and his place taken here by Mr. C. R. Klinck.

Then we have had some additions to the staff, because in these growing times every year chronicles the opening up of new departments of the work, and this year we notice in the Chemical department a very important addition, something probably with which you have not come in contact. I refer to the new Flour-testing or Bread-making Bureau of that department. For a long time our millers have been sending samples from our flour mills away to Chicago to find out whether our flour was good or not. You see, our house wives could have told us that—so they did, when they were consulted, but we

have put in a department here, and now the millers are sending to us; and the Professor of Chemistry was telling me the other day that a miller at Galt has sent two samples and asked for analyses. One was No. 1 and the other No. 4. He was disappointed to find that the lower grade gave him a larger and stronger loaf than the wheat for which he was paying nearly twice as much, and he said, "They must have got things mixed at the College," but a good friend of ours down here in Guelph said, "They don't mix things there." The facts are that the millers of the Province of Ontario may have been selling flour of which they did not know the value, and that they have been charging for a particular kind of flour twice as much as it was worth, simply because they had been led off by color or something of that kind rather than by having accurate methods to go by. And so we are trying to help the food industry. So Miss McPhee, and afterwards Miss Purdy, was engaged and is doing a splendid work.

The work with our girls at Macdonald Institute has also grown. At first it was thought that short courses in Domestic Science proper were all that were necessary for the work. Girls came in large numbers to take the three months' course, but afterwards they found they could be spared longer from home and so we put on a three months' course in Domestic Art, and many of the girls are now taking six months instead of three. Miss Fonda came there to fill the position in September. Then we have created a Department of Economics with a lecturer, in the person of Mr. H. H. LeDrew.

This is not the time nor the place to speak in detail of the good work being done in the several departments, but I should like to call your attention to the fact that at last city people are beginning to take an interest in our work. For instance, we were asked this fall if we could spare our Lecturer in Forestry to lecture in the University of Toronto, and if next year we can spare our Lecturer in Physics to lecture to Forestry students in the University of Toronto, and within the last four or five weeks different organizations in the city of Toronto, namely, the University of Toronto, McMaster University, the Canadian Institute and the Canadian Club, have invited one or more members of the staff of this College to come into that great city of Toronto and tell them some of the things that are being done for agriculture in the Province of Ontario. We feel very much pleased that now, after all these years of slow growth, the institution as a whole is coming to be recognized as a factor in the upbuilding of the Province and of the Dominion.

In closing, I should just like to say, that we appreciate the return, in such large numbers, of our graduates and under-graduates of the years gone by. Professors and lecturers, demonstrators and students may all do their best, but there is over and above that the necessity always for a good tone in the country, if an institution is to do its best work. That tone must come from those who know us best, and so I thank the ex-students, one and all, for their quiet sympathy and support which is backing up the work that we are doing here to an extent which you may not realize and appreciate, but we do and we thank you for it.

ADDRESS.

By Hon. Nelson Monteith, Minister of Agriculture, Toronto.

I have always felt pleasure in coming back to the annual re-unions here, and mingling with those who have been classmates with myself. It is now twenty years since, as a freshman, I came to the College at Guelph. At that

time the equipment of this College was very limited indeed as compared with the College we find to-day. We were glad indeed at that time to skate on the risky Speed, with the air-holes, and all the rest of the inconveniences. We little dreamed at that time that it would be popular at any time in the history of this College to agitate for a covered rink. However, things do move, and progress, all along the line, I think we may safely say, has been made. You have added to the equipment to-day many of the conveniences that at that time we scarcely thought of, although President Mills, who, I regret to say, has been unable to be with us to-night, in a prophetic way looked forward to much of what has been accomplished. He was persistent in his efforts to bring about what we find to-day. He was followed when he was taken—may I say to a higher sphere?—I will not say that, but to another sphere—he was followed by a man who, I believe, is going to make a worthy successor. One of the best signs I may mention regarding him is he is gathering around him a staff of competent men. I like a man whose judgment is fairly good, because it speaks a good deal for himself; and then, not only that, but he relieves me of a great many responsibilities. He goes to those public dinners, and says a great many nice things that please the people, and in that way possibly fits the situation better than I would. (Laughter).

However, I would like to make a few remarks to the young men, because I can now safely claim to be not as young as I used to be. You are now at that stage of manhood when almost "Every goose is a swan and every lass a queen." The world is to you bright, I trust, and you have in your make up that joyousness of life that does so much to tide us over the later and possibly more difficult passages in our life's history. Your cares are largely those of the class-room. These seem to you at the present time large indeed; the ever recurring examinations have to be passed, and they are in themselves a very large feature in your life's history at the present time. But remember that those are but the stepping stones to greater things. You have a great mission in this country, a country of vast resources; a country stretching from east to west for about four thousand miles, and from north to south from five hundred to seven hundred miles, a land that may be occupied in the days that are to come. You have a vast heritage in your keeping, and I trust as the years go on that our agriculture may become even more progressive. I may as well say it here, there has been a great rush from the farms of Ontario to the cities and to the Western Provinces. We are proud indeed that Ontario's sons have laid so well the foundations of things in our Western Provinces. We have given of our sons largely to the laying of the foundations of the West, and we are glad indeed to rejoice in their prosperity; but I would like to draw your attention to the fact that we are doing a little farming down in old Ontario yet; and while the West looms large not only in the eyes of our own people in Ontario, but in the eyes of the old land, do not forget the fact that we are doing some farming in Ontario. I notice by the last printed returns which we have to hand that we produce of cereals in Ontario 186,000,000 bushels. West of Lake Superior to the Rocky Mountains in that same period they produced 172,000,000 bushels; showing that after all, old Ontario, though we say little about it, is producing more cereals than all, we may say, west of Lake Superior. These are the things that begin to make us feel that we have a great mission in this old Province of Ontario, and when we begin to consider the products of our farms in other lines, the products of the West sink into comparative insignificance. Our dairy interests, our live stock interests, our poultry

interests—which are to be displayed down at our Provincial Fair where they are so well exemplified—these represents in themselves vast wealth indeed. So much so, that I think I am safe in saying that the young men before me have a great mission in this grand old Province of Ontario. We have a great work yet to accomplish. We have a number of agencies at work; for, after all, the Agricultural Department of the Government is one of the great educational departments, and we have working in connection with that Departm nt your Agricultural Societies, which begin their existence almost contemporary with the government of this fair Province, showing that the people even at that early stage acknowledged the value of science in agricultural pursuits. Then we have, passing along the line of influences at work, this great College at Guelph. It is one of the many trusts reposed in our charge, and we feel in connection with this institution almost a greater responsibility than all the rest combined, because it touches the very life work of our citizens at an earlier stage in their existence than almost any of the other lines of agricultural effort. But I shall go further to-night in making bold to say that we are not willing to stop at agricultural colleges and extension work. Through the country schools in this Province we are bound, in the near future, to touch still closer the great heart of progress, namely, the rural public schools (cheers); and I trust that we are not infringing upon what some may say is the rightful territory of the Educational Department because we claim, after all, as has been said by one of the speakers here to-night, to touch closely at that educational part of our system which has so much to do with manual labour. We want to elevate and dignify manual labour, and I believe I am safe in stating in the presence of the gentleman who has been called to the high position of the leader of the educational system of this Province in his position as President of our State University, feeling assured of his acknowledgement, that manual labour has a dignity that is too often unappreciated.

I shall not trespass any further, upon your time other than to say, and I can state with a certain amount of assurance that so long as your needs at the College can be shown to be in the best interests of the people of this Province, that you shall not go away empty when you seek. The resources of this Province belong to the people, and it is our duty so long as we occupy the treasury benches to safeguard those resources so that the greatest revenue can be produced from those resources for the furthering and betterment of the people of the Province of Ontario; and we believe that in no better avenue or line of work can money be expended than the training of the hands and of the minds of the people of this great Province of Ontario. Therefore, I say, that we are delighted to have the President of our Provincial University here with us to-night as our guest, not only on account of his known interest in educational effort, but, also because of the interest which he feels in the agricultural education in this Province. From the great agricultural constituency from which the University draws it will find many of its brightest students, and it is to be remembered that on the farms of Ontario about half of the population still lives. I trust that that proportion may not decrease as years go on, because in these stirring times, when so many schisms are abroad indicating the instability of things socially and otherwise, it is well that we have with us that steady influence which is given to society by a large agricultural population. Therefore, it is for the young men to elevate and dignify this great calling that the people may not be drawn away from it.

ADDRESS.

By R. A. Falconer, LL.D., President, University of Toronto.

I have to thank you very heartily for the kind reception that you have given me here this evening, and Mr. Monteith for the words with which he has introduced me to you. When about six weeks ago I received a letter from your President asking me to be present on this occasion, I responded at once in a hearty manner, because I felt that although probably it did mean a speech, and although I was likely to have no time to prepare one, which has also been justified by the event, nevertheless that it was too strong an attraction for me to resist. For many years I have heard of the Agricultural College at Guelph—its fame has gone far beyond Ontario—and everything that I had heard in the past had placed it on such a high level that I was anxious to see it for its own sake, and even, more especially because of the intimate relation in which it stands both to the life of Ontario and to the University of Toronto. Since coming this evening, although I have as yet seen only the beginning, I can recognize that one is in the midst of a very potent, influential, and beneficent institution. I have been very much struck by the tone that I have felt in this gathering. Not only is there a very high level, if we are to judge by what we have heard from those who have passed through the College, but there is a spirit animating the whole institution such as must in the long run benefit it and leave a fine impress upon those who pass through it. If Miss Doak, and Mr. Jones, and Mr. Rose are to be taken as fair examples of what those at present in the College can do, you are certainly to be congratulated upon the degree of their attainments and of what you have been able in addition to do for them. (Cheers). Not only are you to be congratulated because of this, but, further, because of the very apparent heartiness that enters into all your proceedings. One who is in the habit of visiting very frequently different gatherings can soon tell whether or not there is within those who are gathered in the audience a spirit of harmony and unity, and high, earnest endeavor. There is some impalpable method one has of judging, and I myself feel that what I have seen fully agrees with what I have heard so long. You also have the material for great things in the future. I do not mean particularly in your own profession, for I was delighted to discover in the remarks of those who spoke as representing this College that you have here a spirit of education, that you understand something of what education involves, and have recognized something of its privileges. You are evidently versed in the literature of the past, you have also shown your prowess in the present, and what astonishes me is that Prof. Day—who, I am sure, has been rewarded not at all to his merits but in a very happy way, nevertheless, by this recognition from the students to-night—that Prof. Day is a man who apparently has such scientific ability that he can drag a bull all the way three times from Chicago to Guelph. (Cheers). Now, those of you who know the classics remember that men who in the past carried bulls to such a distance were regarded as giants; they were sometimes, you may remember, expected to eat the bull afterwards, as Milo, for instance, who brought it on his shoulders. But such has been the change wrought through science, a science which, I am glad to say, you are learning at this institution, that you can accomplish great things simply by the exercise of scientific skill. Moreover, you have now a subject for the future Muse of this institution. I recognize that one of the speakers was quite a classic; he referred to the Georgics of Virgil. He may remember that in the Georgics of Virgil the most beautiful passage is written concerning the bees. Now,

I think in modern days you can substitute another word for bees, another word beginning with the second letter of the alphabet; your Muse can now rise to the glories of the Chicago Bull. (Applause.) You recognize, as I have already said, what science does for you, and I am sure that in this College the meaning of science has been brought home to you, so that you are aware not only of its applications to the ordinary work that you will meet on the farm, but that you will also go to that work with an enlarged mind, and with a broader outlook; that when you walk across your farm and see in that the possibilities of future material development, you will also be able to understand something of the principles that underlie all the constituents of your farm products, of the soil; yes, and of the very universe of which this soil is a part. A man who knows the principles of science has his imagination awakened to the vastness of our environment. He knows, for instance on the one hand, through his study of bacteriology and physics, how minute are the constructions of the universe; and on the other hand when he turns his eyes to the heavens, he is aware how vast are the distances, how great is the sweep of the law, and that from these greatest things down to the least and invisible, there is the one underlying order, and that this order, I believe you all recognize, is a moral order. A man who goes with such a spirit as this out into his daily work is more than a drudge, and he finds in his work a means of education. His day's toil, as he goes to it in the morning and returns in the evening, becomes to him a means of elevating him; he is not merely lost in the routine of things, but he is stirred to nobler thoughts, and he discovers as the days pass that through the instrumentality of his daily toil he is developing within him those things that are permanent, those things that set him above the daily toil, and that make him the master of the situation where he is. I believe that one of the greatest accomplishments of civilization and of learning has been this, that men have come to recognize that man's life is noble, that the days of slavery have gone by, that manual toil can be elevated and dignified, and that in it, ennobled by the man who does it, he can find a scope for an education that is not confined always to books, but that discovers wherever there is an enlarged mind a means for still extending it further. And so such an institution as this should be sending out into our country men and women of power and insight and of breadth; and we may look to the future to have on our farms and from our farms even greater results than in the past. These results in the past have been great. Those of us who have anything to do with educational institutions are aware that there is no constituency anywhere that sends a finer class of student than the constituency of the farm, and that our country will remain intelligent, and that our universities will be well supplied, as long as we have a population devoted to agriculture and agricultural toils, that is ennobled to its true meaning by an education such as is given in an institution like this.

I hope also, as Mr. Monteith does, that the relative proportion between the farming population and the urban and village population may not be changed to the detriment of the farm. It will be a sad day for us should it ever come—I do not believe that in Canada it ever will—but it will be a sad day should the time ever come when people would rush from our lands into the cities, and crowd themselves into mean and narrow streets; lose their individualities, as is so often the case, in factories, and have their children brought up where they have no breadth and scope, and where they hardly know whether there are stars or not. It is a happy day for a land where the great majority of the people are still in the broad open space of God's world.

Then, it is a good thing to know that there are so many here. I was astonished to learn that there have been over a thousand registered in the past year, that you have over 300 regular men students taking the four years' course, and over 116 women students in residence. That is a very great showing, and I trust that as the years go on the number will increase, that the generous legislatures of the present and future will deal generously with this institution, and meet the needs, as I am sure they will, when they are set before them. But remember that as you go out from these halls, you thousand students, that you also have duties, and that you cannot escape the responsibility of bringing before the people the requirements of such an institution as this. One of the reasons that I rejoice in being present is because I believe that from this College there will go out men and women who, besides being educated and technically trained, will also have a sense of what they owe to the body politic. If the life of the people through the country is kept healthy and pure as it has been, and we come from good stock, if the duties of the citizen are wrought into the minds of those who are on the farm, then I believe there will be a strong, healthful, public interest abroad, and the life of the country as a whole will remain pure, or will be purified. And so I would urge you, when you go out, to carry your education with you, and not to think that you can live a life to yourselves. The man or woman who lives a life to himself or herself may become a wealthy farmer, or a wealthy farmer's wife, but that individual becomes a narrow person as well that is of very little value to any one, and probably of none to himself or herself even. If you go out with a fine sense of your duty, a fine sense of your responsibility to others, with an elevated moral ideal animating you, and resolve even if it be at some cost to yourselves, and with actual reluctance, nevertheless that you will take your place, in the rural parts, in the school sections, in the municipal councils, or wherever it may be, then you will be contributing of what you have received here, and enabling those who come after you to get some greater share of the privileges that you yourself owe to others who have preceded you. Remember this, that none of our best things come to us without effort on the part of some one. There is also an old Greek motto that said "The gods sell us all our blessings in return for toil." These blessings that you enjoy are the result of the toil of others, and remember that the coming generations will hold you responsible if, after entering into such a heritage you do not transmit it, and thus make the heritage of our public life better and purer for those who will succeed us.

I wish you every success, Mr. President, in the institution here. It will give me great pleasure to see students come up to the University from this College to receive their degrees from the Chancellor, and I hope that more of our students in the University, after they have received there what we can give them, will return to receive from you the training for efficient work, and that they will go out on to the farm, and that we shall have men and women consequently of higher and higher intelligence.

PRESENTATION TO PROF. G. E. DAY.

A pleasant incident in the proceedings here occurred, being the presentation of a gold watch to Prof. G. E. Day on the occasion of the Colege students finally winning the Chicago Union Stock Yards Trophy for the judging of cattle, sheep, and swine.

Mr. D. M. Rose was spokesman, and said: Some reference has been made this evening to the winning of the bronze bull, but I am sure that still further reference will not be out of order. The bull which we see adorning our platform is going to stay in Canada, and since he has come to stay in Canada it is fitting that he should receive a proper introduction to this Province and to this Dominion. Of course, the bull naturally wished to spend his declining years in Canada, but unfortunately for him our American cousins had somewhat of a claim upon him, a claim which he did not think he could break. Therefore, the O.A.C. sent a party of students to Chicago to see whether or not they could prevail upon him to come to Canada for a season. You know that two years ago the bronze bull came and spent the winter on College Heights. He enjoyed that winter so much that a second party of students last year had little difficulty in inducing him to stay another winter. Our climate was so genial, and agreed with his health so well, that this year we have been able to prevail upon him to take up permanent quarters at the O.A.C. (Applause). In the words of the song, "The bull has come home from Chicago, and he won't go back any more." He did not come of his own free will exactly. It was necessary for us to send students to bring him here. He is here, ladies and gentlemen, because of the calibre of the teams which have been sent from this institution to Chicago. Because of their clear-headedness, their clear thought, and their decision, they have been enabled to win out against all other competing colleges. But, although the calibre of the men actually composing those teams has been of the very finest, they were not born stock judges; the ability to weigh the merits of one animal against those of another, to give clear, logical reasoning why one animal should be placed above another, this ability was not inherent in these men. This ability has been trained into these men, and much as we desire to honor the three respective teams which have won this trophy for us, we desire still more strongly to honor those men who have trained into these teams the ability to bring the bull to Guelph (Cheers). And who are these men, may we ask? Mr. H. S. Arkell had a large share in the bringing of the bull on the first and second occasions (Cheers), Mr. R. W. Wade has had no small share in the final winning of this trophy (Cheers), Dr. Reed has trained every stock-judging team which we have sent to Chicago, in the judging of horses (Cheers). It has not been our good fortune, to bring to Guelph the horse trophy, but that is not Dr. Reed's fault. How could we learn to judge horses when we had no horses to judge? and, even having horses, how could we win the trophy when the horses we had to judge in competition were as different from those we have here as a Shorthorn cow is from a Jersey? How could we win the horse trophy? Dr. Reed has done his part, and the showing which we have made in horses is but a foreshadowing of the events which are to come (Hear, hear). There is one other man, though, who has had a very large share in the bringing of the bull to Canada; that man is Prof. Day. (Cheers). There have been sent from this College six or seven teams to Chicago. At first those teams were not successful, but Prof. Day has made those early teams stepping stones to ultimate success. He has imparted to each of those teams his own coolness, clear-headedness, and logic, and it is to Prof. Day that we owe the great victory which has recently been won. (Cheers). We look upon the bronze bull offered by the Union Stock Yards Co. now as a Day Trophy. Prof. Day is the man who has brought it here. The students of the College know, perhaps better than any one, just what Prof. Day has done, and we have thought we could not do less than in some small way show our appreciation of Prof. Day's great value to this College, of the great victory he has achieved,

and if Prof. Day will kindly come to the front, we would like to show something of our appreciation for him.

Prof. Day, the students of the College feel that, as I have said, you have brought the bull here. We have all sat under you in various classes; we feel that we know you well, and we know that you know us. We appreciate your personal kindness to us, and for that reason, and for the great victory, we ask that you will accept from us this gold watch. It is but a small mark of our appreciation towards you. We trust that as the moments pass you may be reminded of this most auspicious occasion, and that your happiness and prosperity may gather such momentum as will carry you over all cares and troubles of this life. (Applause).

Prof. Day: A previous speaker said something about facing a crisis, but this event has completely taken the thoughts out of my mind which might have come there under ordinary circumstance. I would just like to say this, because I do not wish to occupy time, that nothing was further from my mind when I came to this meeting to-night, than what has occurred; that I appreciate more than the gift, beautiful and valuable though it is, the kindly sentiment which has accompanied it, and I shall value this gift as representing that sentiment. I thank you from the bottom of my heart for your kindness; I thank the students for the support they have always so loyally given me in my work, because no man can do good work unless he has the material to work upon. It is because we have had good material that we have been successful in the past, and I believe we have good material coming on, and while we may not win trophies, I feel sure that the students of this institution will always give a good account of themselves wherever they may be. I thank you again for this very generous expression of your goodwill.

THE TEACHING OF AGRICULTURE.

By C. C. James, Deputy Minister of Agriculture, Toronto.

For nearly fifty years the subject of agricultural instruction, in some form or other, has been before the people of this country. About the year 1860, when the education system of this Province was being elaborated, it was proposed by Egerton Ryerson, Superintendent of Education, that, in order to make instruction complete, agriculture should be taught, if not in all the schools, at least in some of them, and so he set to work to produce a text-book. Some of you may perhaps have seen that book. It is a book that is valuable even at the present time; in many respects it is still up to date. That came and went and nothing more was heard of agricultural instruction in our schools for many years. There were other things which were considered to be of more importance. The teachers of classics and mathematics and science in turn held the floor, and the attention of the education associations and the people of the Province was divided by the advocates of those branches of teaching. In 1890 a second text-book was issued. It was prepared at the request of the Department of Education by Principal Mills and Professor Shaw of the Agricultural College. Now we had a new text-book, and surely we were going to get the thing done well. I was on the staff of the Agricultural College at the time, and I know that these men labored early and late at the text-book, and we all felt we had some personal interest in the book, and when it was finished we thought that at last a new era had dawned. However, in time it went the way of its

predecessor. Some eight or nine years later I was asked to prepare a text-book, and I thought my time had surely come. The book was prepared and was used in a few schools. It was authorized also in Nova Scotia. An edition adapted to Manitoba was used in that Province. Some of the States put it on their list of recommended books. Judging by the printed reports of the Minister of Education, the attempt was made to teach the subject in many schools, and the impression seemed to have gone abroad that at last Ontario was leading the way in agricultural teaching in the public schools. But, alas! the attendance fell off, the classes decreased, the enthusiasm of the teachers vanished, and the book appears to have now nearly disappeared from the public schools, its place being taken by text-books in nature study. The encouragement given to nature study appears to have driven agriculture as such out of the field.

See what has happened. We have had at least three text-books prepared for the educational system of this Province and placed in the hands of teachers; there have been spasmodic attempts to teach agriculture, and suddenly the whole thing has disappeared from our schools. Many people who are considered as authorities said the text-books were all right. What was the reason that they did not prove effective? The reason has been this, that the teachers of the rural schools, in particular, have never received the training that would make them competent to handle the subject, even when provided with text-books. None of you will say it cannot be taught. None of you will say it should not be taught. But you can see how everything in connection with it failed when the teachers were not qualified to teach the subject. I am sure you are all interested in this subject and you feel that if it can be taught it should be taught.

Having ascertained the one weak spot in the former attempts to teach agriculture in schools, the question arose, "What is the best way to make a more successful attempt?" A very favorable opportunity arose when we had a new Government, with new men coming into office who were willing to try new things, and I had placed in the hands of the Hon. Mr. Monteith, the Minister of Agriculture, a somewhat brief memorandum making a suggestion that perhaps we had begun in the wrong place, and with the wrong kind of teachers, and that we should make a new start with the right kind of teachers.* The suggestion was made that perhaps we could utilize the services of some of the graduates of the Agricultural College, men who should be well equipped to carry on that work. The next point was, where should that work be done, and the suggestion was made that perhaps it could be best tried in connection with our High Schools, because the High School is the only school that represents the whole county. It was then suggested that perhaps we might start on a small scale, with four to six High Schools in the Province. After that memorandum had been in the hands of the Government for some time, my attention was called by President Creelman to the fact that a somewhat similar memorandum had been placed in the hands of the Government by Dr. Seath, Superintendent of Education. When we compared these memorandums we were very much pleased to find that, although prepared entirely independent of each other, they were along similar lines. Now, then, we had for the first time the Agricultural Department and the Education Department co-operating along certain lines, and we felt that there was some hope of something being done. The matter was laid before the Government and we asked them to supply us with such funds as were necessary to make the experiment. The result was that six graduates of the Agricultural College were selected for the work by President

* This Memorandum will be found printed on page 92.

Creelman, and these men are to tell you this afternoon what they have been doing. Six schools were selected by the Government, three in Eastern Ontario and three in Western. A very important point in connection with our recommendation was that there should be established in connection with each one of the schools, an office. You cannot teach agriculture unless you have a man competent to teach, and that man cannot teach unless he has pupils to be taught. Put a man into one of the High Schools and he will find fifty or perhaps three hundred students all aiming towards a profession; there are very few aiming towards farming or the Agricultural College, so that the teacher would at present find few, if any, pupils desirous of taking an Agricultural course. We felt that there must be a large amount of outside work done with the farming community; that the confidence of the farmers must first be gained. We did not expect very large classes during the first year, and thought the best way to start would be to establish in each of the six chosen districts a branch office of the Department of Agriculture, and to place in charge of it the man who was to teach. From that centre he could get a hold upon the farming community, attend the Farmers' Institutes, and meet in his office representatives of the farmers, carry on live stock classes, poultry institutes, and fruit institutes, and so gradually get his hand upon the farming community and prove to them that he had something that would be of benefit to them, and therefore attract to his class-room pupils who otherwise would not find their way in that direction.

Supposing we were to take the knowledge we have already gained in stock-breeding and seed-growing and horticulture and send it all over this country, and get the farmers and the farmers' sons to live up to that knowledge, what a wonderful revolution would take place? What we ask each of these men to do is to go to the different departments of this institution and gather together the knowledge that has already been offered here and go back to his own place and gradually spread that like a little leaven throughout the whole lump of the district; and if they do that there will gradually be inaugurated in this Province a movement which will uplift the whole farming community and will turn many of our High Schools from what they now are, training centres for business and professional life, into agricultural schools. I have come here with a great deal of interest, not so much to give you this talk, but mainly to introduce these teachers, and I shall listen with much interest to what they have to tell us, because what they are doing and what they have done will give you a far better idea of this work than any remarks that I may be able to make.

The six schools were selected by the Government and the men were allotted to these schools as follows:

County.	Town.	Teacher and Department Representative.
Lanark	Perth	R. S. Hamer, B.S.A.
Waterloo	Galt	F. C. Hart, B.S.A.
Essex	Essex	A. McKenney, B.S.A.
Simcoe	Colllingwood	R. E. Mortimer, B.S.A.
Dundas	Morrisburg	W. A. Munro, B.A., B.S.A.
Victoria	Lindsay	F. H. Reed, B.S.A.

The courses of work were drawn up by Prof. McCready in consultation with the staff of the Agricultural College. At the request of the Department of Education an annual inspection of the work is to be made by President Creelman.

REPORT FOR LANARK COUNTY: R. S. HAMER, PERTH.

In coming before this meeting this afternoon, to follow Mr. James in the question of agricultural education, we have all of us been somewhat at a loss to know just what was expected of us. We are, I take it, desired to outline as briefly as possible what progress has been made in the inauguration of the new idea in our respective districts, to note factors and results which may be regarded as encouraging, and to forecast a little the possibilities of future development.

First, as to the work in the school. To a great extent the initial task in my section has been the clearing up of misconceptions. By degrees the townspeople and farmers are getting away from the idea that Perth contains an Agricultural College, and now it is only occasionally that I am referred to as the principal or the president of this college. The real nature of the course, as an option in the Collegiate, is beginning to be better understood, and by liberal use of newspaper space, information as to what the course comprises is being disseminated. As fast as possible, we are eradicating the idea that our course proposes to take any kind of a boy from town or country and teach him all the fundamentals of farming. The course is being laid before the farming public as an opportunity for their boys to receive secondary education, which will have a direct and practical bearing upon life on the farm, and which will tend to educate the boy back to the farm instead of away from it. Emphasis is placed upon the value of the course as a means of sharpening the boy's observation, of developing his judgment, of giving him new and up-to-date ideas, of saving him many hard lessons by experience, of giving him an insight into the "why" of many farm operations, and adding perhaps to his knowledge of the "how" and finally of increasing his general efficiency and making a better citizen of him. At Perth Collegiate, the agricultural branch of the curriculum, as at present outlined, occupies four mornings a week—the time which is occupied by the general students in taking up Latin, Moderns, Algebra, Euclid and Science. For the remainder of the general subjects, the boys of the agriculture option form a part of the regular class. In the agricultural work we are not endeavoring to take up the first year work of the O.A.C. in its entirety. As a matter of fact, some of the subjects are not being taken up at all, but on the other hand, some of the work in other subjects has already progressed beyond the limits of the first year work, and second year work is being taken up. While it is hoped that many of the boys will eventually go on to Guelph, it is quite possible that some of them will not do so, and it is the aim to give such pupils a course which will be complete in itself as far as possible. Supplemental examinations in one or two subjects will place the boys of our two years' course in a position to take up the second year work at Guelph, if they later decide to go on. In the matter of pupils, we were fortunate in forming the nucleus of a good class right at the start. The first morning we had ten pupils; two of these were not considered up to the standard in public school training, and were advised by the Principal to go back to the public school for a year to obtain their Entrance. They did so, and our number was reduced to eight. We have been unable to increase the number, owing to the fact that the large class of nearly sixty which entered the Collegiate this fall crowded the general class-room to its fullest capacity. Our class of eight, however, has been sufficiently large to make it possible to take up the work in an interesting manner, and we have been able to cover more work

and to bring out more points than might have been possible with a smaller class. By reason of the scope of the subject and the many phases of agriculture which may be touched upon, it is not difficult to keep the class intelligently enthusiastic, and I have it from the parents in some instances that their boys would like to take agriculture all day, instead of during only part of it. That they take a real interest in the subject is illustrated by the fact that no invitations were required to bring them out to meetings, such as the Farmers' Institute and the Farmers' Club. In their class-room work they are continually propounding intelligent questions mostly on their own initiative, when bearing on the subject under discussion, but very frequently prompted from home or by their neighbors, on matters related to, or aside from the subjects they are studying. On the whole, the work in the school is encouraging. The chief difficulty lies perhaps in the lack of uniformity in standing of the pupils. Some of the boys have not passed the Entrance. Two of these are older boys and, as far as agriculture goes, are quite able to keep up with those who have their Entrance. We have one or two, however, who are perhaps not as well qualified as they should be, and are somewhat of a drag, especially in the general work, tending thereby to bring all of the class into disfavor with the other teachers. Under existing regulations, the attitude of the rest of the staff toward the agriculture option is best expressed by the word "toleration."

In addition to our two years' course, we are putting on after Christmas a three months' course in agriculture and business for older boys. Arrangements have been made with the Principal of the Business College to give a practical course in farm arithmetic, bookkeeping, correspondence, writing and commercial law, which will occupy the time of this class during the afternoons when I am not at the Collegiate. In agriculture, we purpose putting on a course almost entirely apart from the work of the smaller boys, taking up topics, rather than subjects, giving everything as definite and practical an application as we can. This course promises to be very popular, and already we have several applications for admission to it.

Turning to the other phase of my work as a representative of the Department of Agriculture, I can at present see greater opportunities for usefulness and greater possibilities for development even than in the work in the school. This part of the work takes up much more time than does the school work, and I believe that it is mainly through our work in this capacity that the school work can be popularized and developed. As in the school, so in my office work, there has seemed a persistent disposition on the part of some farmers to get an entirely wrong idea of the object in establishing the office and in placing a young man like myself in charge. I did not have to be told directly that some people were having a merry time at the expense of the young fellow sent down from Guelph to show Lanark County farmers how to farm, and I have no doubt that there are some who still enjoy telling one another how many things they could tell me if they wanted to. Through the medium of public meetings, private conversations, and the press, I have been endeavoring to offset this idea, and to point out the true function of the office and myself in connection with it was merely a channel through which a man may place himself in touch with any source of information he desires. I do not wish to convey the idea that public opinion has been generally antagonistic from the start. In fact, it has been a matter of surprise to me to find so many farmers in active sympathy with the idea, and I have no doubt that the cordial support of some of these has been the chief factor in increasing the popularity of the office, and in prompting men to come in and get acquainted, and usually to ask questions

on almost every conceivable subject. There are enough people now making use of the office to more than justify the expense of its maintenance. In connection with my office work, I have endeavored to reach every accessible part of the country, getting acquainted first with the men whom it is important to know, meeting as many more incidentally, as possible, asking questions and gaining information on local matters and conditions wherever possible, either from farmers, cheese factories or from public meetings. Information thus gained I have found very valuable when talking with individual farmers in the office or in addressing public meetings from a local standpoint. As a means of getting in touch with people in large numbers, and of advertising the new work, I found fall fair exhibits supplied by the College of very material assistance. This proved a very popular attraction, and the directorates of all outside fairs, which it was possible to take in, were quite willing to bear all expenses connected with it.

One of the questions in my district which affords room for investigation is the improvement of the immense swamp areas, and rendering productive of the muck lands which have ceased to produce. One enterprising farmer near the town is co-operating in the investigation of this question and has turned over and fenced off sufficient land to give ample opportunity for experimentation with commercial fertilizers. If it is found possible to effect material improvement in these soils at a small cost, it will undoubtedly mean much to the owners of hundreds of acres of muck lands, which occur in every part of the county, especially in sections when award drains and municipal drains are arousing the owners to seek a means of rendering soil productive which it is now costing more than taxes to retain, and in which the first step towards improvement—drainage—has been accomplished or rendered easy of accomplishment.

In addition to the role which the office is gradually assuming, as agricultural headquarters for the surrounding district, the large outer room has become the rendezvous of the Farmers' Club, organized this fall at the time of the Farmers' Institute meeting. This club promises to be a very live institution, as the attendance of 47 at the first meeting indicates. We have many men in our section who are well qualified to introduce subjects and those who have already handled subjects for us were, in fact, well up to the standard of the regular Institute speakers. Evidently the discussion will be the most valuable feature of the club meetings, and contrary to the frequent experience in Farmers' Institute work, we have no trouble whatever in getting practically everyone present to take part in the matter of bringing up associated points, of contributing additional information, of corroborating statements by practical experience, or of asking questions. The interest taken by the young men is especially encouraging, and if meetings up to the present are to be taken as a basis of assumption, we can certainly look forward to a very interesting and educative series during the winter.

Time does not permit of more than brief mention of some of the more outstanding features which have already been accomplished in the matter of organization, nor does it admit of much enlargement on the future possibilities of the work, both in the Collegiate and in the office. Suffice it to say, that at the present time the latter is growing much more rapidly in popular favor, and as an outpost of the Department of Agriculture is already making its influence felt in the dissemination of information, and will eventually be able to do very important service in the investigating of local questions and in the collection and summarizing of facts, figures and other information of agricultural importance in the county and surrounding districts.

Before giving place to the next speaker, I should like to make brief mention of the co-operation we are receiving. I have already mentioned the assistance rendered locally by progressive farmers, and by the officers and members of the various farmers' organizations. In addition: I have to thank the Public School Inspector for material assistance in getting together a class in the Collegiate; our local member, Col. Matheson, for many references on the public platform in his visits to various parts of the riding, and the local press both in Perth and adjacent towns for generous devotion of space to editorial comments, and to articles I have submitted from time to time since June. I have also had much official assistance from the different branches of the Department at Ottawa, from the Central Experimental Farm, from our own Department in Toronto, and last, but by no means least in importance, from Guelph. I think there is scarcely a man on the College staff from whom I have not had to request favors of various kinds during the last four months, and while I have the opportunity I should like to express my appreciation of the cheerful manner in which they have rendered assistance whenever it was possible.

Report for Waterloo County: F. C. Hart, Galt.

The report of the class at the Galt Collegiate agrees in a measure with those already mentioned. At present there are eight students in this department, only some of these, however, taking the full course, the others coming in for special subjects, such as poultry, entomology, etc. These latter students are from the town; the others in the class are farmers' sons who are taking the full course at the Collegiate leading to matriculation, and we have arranged the programme so that they can take agricultural subjects in lieu of some of the non-obligatory subjects in that course. As might be expected, it is the farmers' sons who are taking the most interest. We are fortunate in Galt in having on the staff an enthusiastic science master, who, in his teaching in the regular classes, gives an agricultural trend to his instruction. The manual training teacher also is co-operating, and the agricultural students are given models and work in that department that apply to our work.

These three departments in the school, together with the domestic science, are planning to institute a fall fair or exhibit on a large scale, this exhibition to be conducted and the exhibits prepared wholly by the students.

In the class room we have not taken up our studies exactly as outlined in the circulars, but have endeavored to suit these studies to the pupils in the class. As was anticipated, this part of the work is of slow growth, but prospects point to increased interest and usefulness.

But, I realize that for this year, at least, the bulk of the work is outside the school—getting acquainted with the farming community, visiting the farmers in the field, talking and answering questions, and helping in any way we can, and in many of these little ways in which it is hard to report upon. For instance, driving up to a place and finding the proprietor in the orchard, opens up an opportunity for a talk right on the ground on, perhaps, some insect or disease that is troubling him and gives an opportunity for pointing out the value of spraying. In many little ways of this kind in going around this fall I think that good has been done, and though it does not appear much in itself, is spreading the gospel of preventing waste and the value of study as applied to the farming business.

The other methods I have used in getting acquainted, etc., are visiting the fall fairs, having an educational exhibit at some of these fairs, speaking at the fall institute meetings, getting acquainted at the Saturday markets. The local grocers in town who have a large trade with the farmers, have been used also, especially in the distribution of bulletins and information. In this way I have placed literature just where it will do the most good.

So far we have held in our district but one meeting, at Ayr. Professor Gamble came down to this meeting and after his address we had an interesting discussion on the feed question. The interest awakened in little meetings of this kind was shown here in the desire of those present to have a regular series of such meetings during the winter.

In such special meetings and farmers' clubs of this kind all over the country, we hope, in a quiet way, much good will be done.

We have also been awakening an interest in cow-testing. So far I have been doing quite a little of this myself for individual farmers, and, in this way, spreading the knowledge of the value of it. We hope to have a strong association of this kind in the district.

Of course we have the office and reading room comfortably fitted up on Main Street in the town, and it is being used to a considerable extent by the farming community. Not only all the leading agricultural papers are here, but opportunities are presented of distributing bulletins and literature where they will do the most good. In talking with farmers and others who come in we are able to place in their hands bulletins on the special subjects in which they are interested. One peculiarity I have noticed with regard to the reading room is that it is used by the town folks about as much as by the farmers. In fact many about town who own gardens come in to ask questions about insects, etc. The poultrymen also use it during the evenings. These rooms have also been placed at the disposal of the various agricultural societies, and these have been holding their regular meetings here instead of at the various hotels.

I wish to express appreciation of the help afforded, not only by the College but by the various branches in the Department of Agriculture at Ottawa, to the local press for advertising, and the officers of the agricultural societies in the district, all of whom have responded most readily for any help or information asked for. And though nothing sensational has as yet been accomplished, I believe that in a quiet way the work so far has shewn the fact that there is a big field of work here not only in the school, in the giving the pupils there, so many of whom come from our farms, a chance to get an education for their home work and leading toward the farm rather than away from it, but in these short courses and extension work outside, in awakening among the farmers themselves a deeper interest in the value of education and study of the principles underlying their business, and the necessity of the intelligent application of these principles.

Report for Essex County: A. McKenney, Essex.

The department of Agriculture was established in the Essex High School under very favorable conditions. From the first, the outlook for the eventual success of the movement was good.

In Essex are to be found the prime requisites for the success of a departure in this direction. In the first place there is at the head of the

school, a progressive, broad minded, and sympathetic principal, who has given his enthusiastic support in every possible way. Then, also, the Board of the Essex High School is composed of men who fully recognize the value of education to the farmer, and they have done much by their personal help and generous financial assistance to give the new department a proper start. The Essex County Council also supported the work with a very liberal grant, and there is no necessity of the work being handicapped for lack of finances.

The support of such men as I have mentioned has been encouraging, but it must be remembered that the farmers of the county had not asked that a department of Agriculture be established in connection with the Essex High School, and, though we met with no active opposition, in the greater number of cases, we had to contend with indifference. This was, however, chiefly due to the fact that the work was not thoroughly understood.

As it was necessary to open the school in September, there was scarcely sufficient time to clearly demonstrate to the farmers exactly what we intended taking up in the school. The course in Agriculture was, however, explained as fully as possible through the medium of the local press, and by means of printed advertising matter, which was thoroughly circulated throughout the county. This, supplemented with a great deal of personal work, was the plan of our campaign conducted before the school opening.

When the term opened we had as a result of our efforts two students, who registered for the work in agriculture. These boys spend four half days a week of their time upon agricultural subjects, the remainder being taken up with the regular obligatory subjects of the high school.

The course so far has been very popular with these boys, who have signified their intention of remaining for the two years course, and at the end of that time, entering upon a more extended course at the O. A. C.

I have already mentioned the fact that we met with a great deal of indifference among the farmers when we first began to introduce the work in agriculture. In order to overcome this it was decided to use the fall fairs as a medium through which to show them the practical nature of the course which we intended to give. At the county fair, a judging competition for young men was instituted, suitable prizes were offered to induce them to enter into the different classes. Eighteen young men entered, and the competition was in every way successful, and did a very great deal towards popularizing the work taken in the high school. As a supplement to this work we made at every fair in the county, except one, an attractive exhibit, each feature of the exhibit being such as to impress thoroughly some practical feature of the work taken up by us in the school.

For instance, to illustrate the value of the experimental plot in connection with the school, we had a germination experiment upon exhibit, showing plainly the difference between sowing large plump, small plump, broken, and shrunken seed. Specimens of the San José Scale were shown upon the twigs and upon the fruit, and hundreds of farmers who had not been able to recognize it before became acquainted with it and the best remedies used to keep it in check. This work at the fall fairs was a very great assistance to us in many ways. The work in agriculture was more thoroughly understood, and we were able to get acquainted with farmers and conditions in this way better than would have been possible otherwise. And it was not without practical results, for at a short course of one week in stock and grain judging lasting from Dec. 1st to Dec. 6th, we had an attendance of 60 farmers' sons, who expressed themselves as thoroughly satisfied with the course. Several requests have been received since, asking us to conduct similar classes at different centres throughout the county.

The prospect for a good attendance of farmers' sons during the winter months is bright, and in every way the outlook for the future is encouraging.

There is another side to the work which we have been doing in the county and that is in connection with the local office of the Department of Agriculture, and it is through the work done in this office that the Agricultural department in the high school will eventually be made a success. Through this office we are enabled to bring the farmers into more direct touch with the Department of Agriculture and with the O. A. C.

Owing to the nature of the crops grown in Essex, it has been more difficult for the Department of Agriculture and the College at Guelph to keep in touch with the farmers than perhaps any other part of the Province, and for this reason it is important, and necessary, for the Department of Agriculture to have a man upon the spot to get acquainted with the conditions as they exist and knowing the conditions to work out and put the farmer in touch with the solutions of the problems they are up against.

As an instance of what the department can do for the farmers of Essex county, I shall outline one or two things which we hope to do during the year.

The San José Scale is an insect pest which has gained a very considerable footing in the fruit-growing districts of the county. In one township a by-law has been passed for the enforcement of the Act. During the past year an attempt was made to enforce this Act, but the attempt was not very successful, and the chief reason for this lack of success was due to the fact that many of the growers were not able to recognize the scale, and did not understand the mixture and application of the lime and sulphur wash, which was the remedy prescribed. In order to overcome this difficulty, to a certain extent, we intend holding demonstrations throughout the township. These will be held in badly infested orchards, in localities where spraying has not been practised. Here a practical demonstration will be given of how to mix the lime and sulphur, the proper manner and length of time to cook, and also the proper manner in which to apply it. These demonstrations, with a system of careful and thorough inspection will, we hope, help to stamp out the scale in these parts to a great extent.

Another important field in which there is room for investigation is in connection with the tobacco crop. There are many different lines which suggest themselves in connection with this very important crop. But there is one line of work in which something can be done for the grower to advantage by the Department of Agriculture. Although the farmers have been growing tobacco extensively for some years, every year in the history of tobacco growing in this county there has been some difficulty in obtaining strong, healthy, young plants. Many farmers, rather than run the risk of growing their own seedlings, depend upon neighbors and others for their supply, and as a result, strong young tobacco plants are often scarce and high priced. Upon the plot of ground acquired by the High School Board it is proposed to carry on investigation work with the different methods of germinating and growing young plants, with the hope of finding out some uniform method which may be adopted by the growers of the county to advantage.

There is other work upon which we are at present engaged, such as Institute work, etc., but the two instances which I have outlined will serve to show the nature and value of the work in which we are engaged and through which we hope to make the work in Agriculture in Essex a success.

REPORT FOR SIMCOE COUNTY: R. E. MORTIMER, COLLINGWOOD.

As is intimated in the programme, I am stationed at Collingwood, in Simcoe County, and those of you who may have travelled in that locality will know that at the foot of the Blue Mountains, along the shores of the Georgian Bay, there is one of the best fruit districts in Ontario. As well as the climate being very suitable, the soil is well adapted to fruit-growing, and every farmer is to a greater or less extent interested in that line of work. In this fruit district, as it can be properly called, we would naturally think grain-growing and stock-raising would scarcely receive such attention as is given them in other localities, and rightly so; though, I do not wish to convey the idea that we have no live stock and do not produce grain there. Those of you who best know the district, will understand me when I say that farmers there are really a combination of fruit-grower, stock-raiser and grain-producer; can you realize the pleasure there is in working among such an intelligent class of yeomanry?

To speak of my work in direct connection with the Collegiate Institute, I may say that from the beginning of the term in September, I have had a class in Agriculture, there being at first two pupils, though only one of these continued the whole term. The attendance at the Collegiate this year, I believe, is much greater than has been for some time, consequently all the classes are large and each instructor finds his time fully occupied, so that I was asked to take Biology with the lower form, which I did until that subject was replaced by Physical Science early in November.

In Collingwood we claim to have a Board of Education, composed of conservative men. We can leave aside the political aspect, and still use this qualifying adjective, for it has been proved that they are particularly conservative in the matter of expending such sums of money as would be required to make alterations in or build an addition to the school, so that better accommodations for all the classes would be given. Their reasons for being particularly conservative, at this time, are perhaps two; and are as given,—First, our school has been built since 1879, and has not the modern equipment of schools built recently, besides it does not command the most suitable location; secondly, they feel that they would scarcely be warranted in spending any considerable sum of money for our department until it is shown that the farmers are going to make it a school where their sons are to get such instruction as will enable them to become very successful men in their life-work. These, then, are the reasons that I have had no special room for my work, but have had to do my teaching sometimes in the Science Laboratory and sometimes in one or another of the rooms that happened to be unoccupied at that particular time.

We have been fortunate enough to procure a splendid little plot of ground, to be used for experimental purposes and school garden work in general; though not close to the school, it is quite accessible, being at the corner of Tenth and Maple Streets, and lying with its broadside to the latter, which is one of the chiefly travelled thoroughfares of the town.

To get rooms for the local office of the Department of Agriculture was a problem that required considerable close attention; we might have had a much larger place than we have, but it would have been at one end of the main street, not at all where farmers usually congregate, and the rental would have been much higher than where we have located. Our present

office is very central, and quite comfortable, being in a new block that was only completed when we obtained it. That office is now equipped according to instructions given from the Department at Toronto, with desk, chairs, tables, book-cases, filing cabinets and shelves bearing volumes of bulletins and reports that have been issued by the department during the past several years. An outer room of the office is supplied with a table upon which are kept the latest agricultural newspapers and journals, and around which are half a dozen very comfortable arm-chairs.

As yet, we have done nothing in arranging for short courses in seed and stock judging, thinking it better to leave that for consideration when the farmers grow more or less enthusiastic in the project; but, when we do inaugurate such courses, I believe, instead of holding them in town where the cost of keeping stock would amount to so much, as well as the rental for a place of meeting, we shall hold them at, say two places, farmers' homes near by villages, to which it will be possible to get a fairly good attendance, for there is scarcely any village so small, now-a-days, but that it has a congregation of young men several evenings in the week; we could then have the use of the farmers' horses or cattle or sheep or swine for judging purposes, and the only expense to be met would be that of advertising, which would have to be paid no matter where the meetings were held.

I have had the pleasure of attending the South Simcoe Teachers' Institute at Stayner, and the East Grey Teachers' Convention at Thornbury, at which places I addressed the meeting, outlining the work under way at the Collegiate at Collingwood. I find the farmers are quite anxious that I should go among them, and the directors of the Farmers' Institute are instituting a series of special meetings which I shall address, discussing the work, as we hope to have it done in the school, or speak on some other subject in which they are directly interested.

Just a word regarding the advertising we have given the department at Collingwood. We have not confined it to columns in the local press, but we have prepared circulars that outline the course very fully and these have been well distributed throughout the district. Later we got out a number (2,000), of cards of this style (exhibiting one about the size of an ordinary postal card), bearing an inscription which runs as follows:

IF YOU HAVE A BOY

Who will stay on the Farm, while his brothers may enter into various Professions,

WHY NOT EDUCATE HIM

for his life work, brighten his prospects, increase his income, and make his life the happier by giving him a course in Agriculture at the Collingwood Collegiate Institute?

For particulars apply to

P. W. BROWN, B.A.,
Principal.

R. E. MORTIMER, B.S.A.,
Agriculturist.

REPORT FOR DUNDAS COUNTY: W. A. MUNRO, MORRISBURG.

Judging from the remarks of the previous speakers it is quite evident that we six teachers are working along slightly different lines, with one object in view; and that the differences in the modes of operation are due not so much to the individual characteristics of the several teachers as to the peculiar conditions of the different localities in which the schools are placed. While one is in a corn and fat hog county, another in a beef county, and others subject to other peculiarities, Dundas is all given over to dairying; and all efforts, therefore, point to the improvement of the dairy industry.

When I returned to my work in August after having spent the month of July in conference at Guelph, I bent my efforts towards the establishment of a class in Agriculture in the Collegiate Institute, and with that end in view visited every quarter of the county, meeting and talking with farmers, and visiting picnics, socials, and teachers' conventions. With the assistance of an entomologist from Guelph, and a member of the Seed Branch from Ottawa, I conducted weed and insect exhibits at three fairs with good results. The exhibits were visited by hundreds, and favorably commented upon by farmers, teachers, and newspaper men.

But when the Collegiate opened there were no students in Agriculture, and day after day passed and still no students, and it was quite evident that I must set my sails to another tack. It was a debatable question for a time as to what course I should follow. The Principal desired that I teach part of the Science work in the Collegiate and so attempt to draw to myself a class in Agriculture from the students in Science. To this I objected for three reasons:

First, I would be working with a class who had already made up their minds to not follow Agriculture.

Second, I had given up the teaching of Science in a High School five years previously for the study of Agriculture and did not care to turn back.

Third, I was being paid by the Department of Agriculture, and if I were to teach Science to the neglect of Agriculture, the Department would soon find another man to take up the work to which I had been appointed.

My plan was now to visit each locality in the county, and by some means make myself acquainted with one man there and thoroughly propound to him the scheme. I talked of having a short course of two weeks in stock and grain judging in January or February. Every man to whom I presented the scheme thought it a good thing and that it would be a success. But every man to whom I put the question, "Will you be able to attend?" invariably answered, "No! I cannot leave my work. There is no one but myself to do the chores." Then I asked the question, "If I have a day on one subject, say Dairy Cattle or Horses, or Seeds or Grain, at your centre of business in a barn or blacksmith shop, and the evening lecture in your school house or town hall, will you be able to attend?" and the answer was invariably, "Yes!" My attention, therefore, has been directed for the past two months and a half, towards arranging for a circuit of these Day Schools, getting suitable animals, making the acquaintance of and obtaining the moral support of the leading men of the different communities, and in every possible way, bringing the farmers to understand that there is something pretty good being newly offered by the Ontario Department of Agriculture.

It is worthy of remark to see the difference in the way I am received by the farmers every succeeding time I visit a locality. The first time I

visit a place I am looked upon as a new type of book agent or apple tree agent, and every succeeding visit I am received more openly until now, there is scarcely a home in the county but would make me welcome if I were to make a call.

A series of four Day Schools was arranged for the last week in November, and I look upon them as the most prominent corner stone in my experience thus far. My plan was to score a dairy cow in the forenoon and conduct practice work in judging dairy cattle in the afternoon. A lecture on some phase of the breeding, feeding and management of dairy cattle in the evening was followed by a detail of the new work of the Department of Agriculture. The place of holding the day lectures was a large well-ventilated, well-lighted stable or preferably a blacksmith shop.

The first day I was on the ground before 7 o'clock, sixteen miles from home, and spent from 10 o'clock in smock and overalls, cleaning and combing some good, but dirty cows, and cleaning a stable. Over twenty farmers turned out for the day demonstration, and in the evening thirty-four came with lanterns and lamps to the school house.

Each day was in a measure a repetition of the previous, except that after the second day the cleaning operations were performed previously, and the day meetings held in blacksmith shops.

But I had a different reception in different places. In one locality two representative citizens told me that their farms were paid for, that they did not want to bother with agricultural information, and that they would rather go to a dog fight than to my lectures. The sentiment expressed by these two men seemed to permeate the whole community, for it was difficult to find either good cattle or good buildings, very few farmers turned out to my meetings, and I was charged exorbitant prices for hotel and hall rent. At all other three places nearly every farmer for five miles around turned out, over one hundred in one case and one hundred and fifty in another, votes of thanks were passed, requests put in for a return on other subjects, and when I went to pay my bills, found most of them settled for. In one place I had the use of two large herds of Holsteins, from one of which President Cumming saw fit to choose a cow for the Truro Experiment Station.

I expect that the most of my time will be taken up with Day Schools until the end of March, for I am encouraged to believe that in progressive communities the farmers are going to take hold of them and come to see that the Agricultural department in the High Schools has something good to offer.

In this connection I should like to mention a difficulty I have in travelling. I have to use livery horses almost entirely and they are not good. The liveryman has no opposition and some of his animals seem to be a combination of all the blemishes that ever overtake a horse. If I were allowed expenses for a horse of my own it would be less expensive for the Department and more satisfactory to myself.

Concerning the office I have little to say, for the reason that it is not in operation yet. It is a former laundry stand. Some of the other teachers have been dubbed professor, and other dignified terms, but for six weeks I could not persuade the Chinaman to do any laundry because he thought I was prepared to run opposition. It is a well located place on the ground floor with a large plate front. But the former occupant could not be persuaded to move till the middle of October, and what with outside work it has taken me until the present to get it in shape. I am laboring under the disadvantage of being in a border town, which gives me but half the surrounding country of an inland town; but nevertheless I anticipate much from the office.

For experimental purposes I am given fourteen acres. This is to be laid out in lawns, campus, courts, and experimental plots, proper. As yet very little has been done, but next summer is full of hopes for me.

After my plans for the autumn were laid a student came upon the scene. He is not a farmer's son, and had no agricultural experience. I am privileged to teach him after school hours, and he is progressing as well as can be expected under the circumstances, for he is a bright youth; but having to start so low I cannot hope to make of him what I might of a farmer's son, other things being equal. If the teacher of Agriculture as well as the principal and the School Inspector had a say on the question as to who should enter for the Agriculture option it might save some future complications.

This is a most important work, and gives a man scope for his entire capacity. There are great difficulties to be overcome, and I wish to acknowledge here that but for a sensibility of the fact that the best minds in the country, and more especially those of the Agricultural Department, are supporting it, I should at times have almost despaired. I desire here to publicly thank the Deputy Minister for his timely advice and support. He has stood behind me more than once.

The farmers of this country are awakening to a desire for a more scientific investigation of the principles under which they are working, and if we as teachers now meet this demand in an able manner, these schools will stand as a mark of great moment in the history of agriculture.

Report for Victoria County: F. H. Reed, Lindsay.

Mr. James has just given to you the general outline of this latest step in agricultural education. We, the teachers and pioneers in the six counties selected, will attempt to tell you briefly how the plan is being worked out in our respective districts.

The work may be divided into two divisions, the teaching of agriculture in the High Schools and Collegiate Institutes, and the work done through the town office. With many, and particularly those engaged in educational work, there is a tendency to judge the success of our work by the number of students in the agricultural class in the Collegiate. At the outset I wish to state that I have one student in my class, and that for this first term I consider that just one too many. That seems a strong statement, but let me explain. This scheme of agricultural classes was not definitely formulated until June, and was not placed before the people until July, a very busy time for farmers. It is from the farm that the great majority of our students must come, for the course is planned specially for farmers' sons, as a preparation for life and work on the farm. The reason we have not this year more boys in our class is not because the farmers do not appreciate the advantages of agricultural education in the Collegiate, but because they are not yet familiar with what is offered. It is for this reason that I say I have one student too many; because I could do more important work elsewhere. For this first year our time would be well employed outside of the Collegiates. This is a movement in education intended specially for the farmers, and to make it successful we young men must get in close touch

with the farmers of our districts. We must meet the farmers on the farm and there learn what are the problems before the men and boys on the farm—learn how we can be of use to the farmers. No one in this age disputes the advantages of agricultural education, but because of the great scarcity of farm labor, and the great need for the boys at home, we must bring home to both the boys and their fathers the advantages of an agricultural education before we can induce the boys to come to the Collegiate.

Right here is one place where we can be very useful: in bringing farmers into closer touch with agricultural education, and into closer touch with the Ontario Agricultural College. To-day less than one per cent. of the farm boys of the Province of Ontario between the ages of 16 and 21 are taking a course at this College. One great reason for this is a lack of knowledge concerning the advantages afforded by a course at the College. As we young men go among the farmers we can fully explain the broad course of education and training given by the College; we can arouse much greater interest in the O.A.C. and can send many students to its class-rooms. There are many young men who, after spending three or four years on the farm, realize their lack of knowledge of farm methods, and of the underlying principles of crop growing and stock raising. These young men consider themselves too old to go back among the boys at the Collegiate, but if we can come in close contact with them at this time we can send many of them to the College.

Another way of reaching these young men is by special winter courses in the Collegiate. In Lindsay we are offering a special short course in bookkeeping and agriculture. The course will take up the most practical subjects of agriculture, and bookkeeping as it should be applied to farm operations. Students will be given a good working knowledge of all common business forms, and a training in keeping farm accounts. Special effort will be made to induce more business like methods on the farm, and the keeping of an account with each field and each animal, or "bunch" of animals on the farm. The course in agriculture will take up animal husbandry, the breeding, feeding, and management of horses, cattle, sheep, and swine; dairying, the formation and care of a dairy herd, and methods of testing and caring for milk; field husbandry, a study of the soils and crops of the farm, surveying for tile drains, and measuring land; horticulture, growing of fruits and vegetables; veterinary science, a study of the blemishes and common diseases of farm animals; agricultural botany, a study of the grains, grasses and weeds of the farm; poultry, rearing of farm poultry for egg and meat production. This is a special course arranged for young men who can spend only a few of the winter months in school.

Next year it is my belief that we shall have large numbers in our agricultural classes. These students will be secured from the farmers' sons who will in July next pass the Entrance. Before the schools close we shall visit the country schools, and explain to the boys what is meant by the agricultural course in the Collegiate. By learning the names of those who are interested, and by talking the matter over with their parents, I feel confident we shall secure large classes.

The other branch of the work, and this year the most popular branch, is done through the town office. This is intended to be an information bureau, and a popular resort for farmers when they have a spare half hour in town. The Lindsay office is furnished as a reading-room, with chairs and a large table on which are always copies of several of our farm papers and magazines. This office is also used as a board-room, and in it the Horticultural Association, the Farmers' Institute, the Poultry Association, the Agricul-

tural Society, and the School Teachers' Association all hold their executive meetings. At every possible opportunity I have been getting acquainted with the farmers of my district, and inviting them to make use of me, and to call on me at the office. I visited all the fall fairs, taking with me an exhibit of weeds and weed seeds, insects and insect remedies. I have spoken at all the Farmers' Institute meetings of the county, some twenty-four in number. I have attended meetings of several of the executives of the fall fair associations, and have addressed many of the annual meetings of cheese and butter factories. These meetings have brought my work before the farmers, but where I find my best work done, and where I really meet the farmers and their difficulties, is when I visit their farms, or when I meet them two or three at a time, at sales or on the street. Every farmer daily meets many problems. On many of these problems he could find help in the many excellent bulletins issued by the College, and by the Provincial and Dominion Departments of Agriculture—if only he had time to look them up. The farmer is now, however, a very busy man, and we no longer hear of the long winter evenings in the farm home. Now that so much stock is stabled, the winter evenings are largely spent doing chores by lantern light. Our duty is to have this information readily accessible, and to be prepared to either answer or secure answers to all questions concerning agriculture. Already many of the farmers of Victoria County are coming to my office, and asking all manner of questions. As many as twenty-two farmers have called in a day, and the average on market days for the last month has been seventeen men. Mixed farming is the rule in Victoria County, and the questions include orchard pruning, vegetable and fruit growing, the raising of stock and diseases of stock, and many questions concerning tile drainage. The most frequent inquiries, however, are regarding identification of weeds and methods for destroying weeds, particularly the perennial sow thistle. Also I have frequently been asked questions concerning the improvement f farm crops by seed selection, and have placed several farmers in communication with the Canadian Seed Growers' Association. In our county the field crop competition has proved a great incentive to improvement, and from men who took part in this many inquiries have come concerning good seed.

I do not wish to trespass further on your time, but I should like to mention one more feature of my work. Although many farmers are coming to my office for information, and though our farm papers have a wide circulation, and though a number of very valuable bulletins are annually issued by the Departments of Agriculture, and though our Farmers' Institutes meetings are well attended, though all this be true, yet we are not reaching the boys and young men on the farm. The men who are attending Institute meetings, who are studying farm bulletins, who are reading farm papers, are the older farmers, men who have learned by experience much concerning farming, men who have also learned the value of agricultural education. But where are the boys, and the young men? We must reach them, and to reach them we must have something special. It is for these boys and young men that the Government has established agricultural courses in the Collegiate Institutes. It is also for these boys and young men, as well as for the older men in Victoria County, that we have prepared at Lindsay, to give in January, a five-day Short Course in Stock and Seed Judging. The farmers, young and old, are going to come to this course in large numbers, and this course alone, in improved crops and better stock, will give ample returns for all the money which will this year be expended in agricultural education in Victoria County.

THE DEPARTMENT OF AGRICULTURE AND AGRICULTURAL COURSES IN HIGH SCHOOLS.

(This Memorandum was presented to the Minister of Agriculture in 1906.)

The undersigned begs to submit for consideration a plan that proposes to assist in the introduction of the teaching of Agriculture in the High Schools of Ontario, and, at the same time, greatly extend and materially improve the work of the Department of Agriculture.

The ideal organization of the Department will be to have a specialist, an agent, a trained agriculturist, located in every County or District of the Province, paid by the Department and whose entire services will be at the disposal of the Department for the benefit of that County or District.

This local representative would be the moving or directing spirit of every agricultural organization, assisting the famers, directing special movements for improvement, inspecting, instructing, advising, reporting the appearance of any new pest or disease, procuring information in regard to all questions that farmers would ask, keeping the Department informed as to all agricultural conditions, and be the direct link between the farmers, the Agricultural College and the Department. In a dairy section this man should be a specialist in dairying, in a fruit growing district he should be a specialist in horticulture, and so on for all sections.

He should have an office where he could be found for consultation at stated times, and at other times he should be out among the farmers. He would be the directing man in the Agricultural Society, the Farmers' Institute, the Horticultural Society, the Farmers' Club. While he could not be expected to know all things, yet he would be able to procure information for them as might be desired. He would be the man "on the spot" to report new diseases, new pests as soon as they arrive and to report to headquarters with a view to procuring help. Through him the special needs of the district could be investigated and all Departmental movements could be directed. He would be able to systematize a great deal of work that is now done spasmodically. He should be expected to go to the Agricultural College for, say ten days or two weeks every year, to inform himself as to the new work there being done with the object of taking the results back to those farmers who are unable to visit the College. The result of personal contact would be found much more effective than through the sending of printed reports and bulletins. To put it in another form, he would increase many fold the value of printed publications. Set down in a county a live, energetic, enthusiastic young man trained in the best practice of farming and having an Agricultural College education, and tell him to study the farmers' conditions, assist them in their work, to find out their needs and direct them along the best lines, and in a few years the effect should be most satisfactory.

At present the Department is working very satisfactorily, in many ways and in many places, but with a corps of workers of the class I have referred to the benefits would be more equally and widely distributed, and the work so systematized that the agriculture of this Province would be extended and intensified throughout every County and District. The future of Ontario agriculture lies largely in specializing the production of high class articles suited to each section,—it would be the duty of these men to assist in this specializing.

The work to be done by these men would, of course, largely depend upon themselves, though the Department could direct them more or less. As it is, requests for help come in continually from all parts of the Province. Help

is asked in a great variety of ways; this work could be directed and assistance given through these men. There is plenty of work to be done if only we had the men located ready and able to do the work.

Where would we get these men? Naturally among the graduates of the Agricultural College. The demand for such men would stimulate young men to train themselves for this work. Beginning with four or five men whom we could pick out and train specially for this work, we could gradually incease the number until the whole Province was covered.

What would it cost? We should be able to secure these men at, say $1,000 a year. If we located four the first year, the entire cost at first should not exceed six thousand dollars. Part of this would be saved along other lines: where now we are compelled to engage special men and send them out to do special work.

What has the first question as to teaching Agriculture to do with this? My answer is as follows:

Select now say four young men and also four points at which they would be stationed. Make this proposition to the school boards of these four towns: the Department will provide your High School with a teacher of Agriculture for the next three years if you will permit him to organize a class in Agriculture in your High School, and also if you will provide him with a small plot of ground for experimental purposes. This young man would conduct the classes and with his class take charge of the experimental plots, the material for which would be supplied by the Experimental Department of the College. This would take up a portion of his time. The rest of his time he could devote to the other work of the Department referred to above. At the end of the three years' work the Board of Trustees would be expected to continue the work of instruction, themselves paying for the services of the teacher of Agriculture just as they provide the other teachers or masters of the school, and the Government representative would be free to give his whole time to the general work of the agriculture of the County. This agricultural teacher would be able to give the teachers in the model school some instruction in Nature Study, attend teachers' conventions, and also from time to time advise with rural school teachers who were really trying to teach their pupils the simple principles underlying agriculture.

This plan or scheme is perhaps very crudely outlined, but it must be remembered that no scheme can be definitely planned from the first. The main thing is to have some plan to start on, something for a beginning, and then wisely direct it along lines of development as experience dictates to be the best. The great thing is to make a start and then let it work out naturally. There are two things very evident: the first is that we should do something at once to assist in the work of teaching agriculture, and the second is that there is an overwhelming amount of work that can be done in the way of assisting the farmers of this country. One serious defect in our system so far has been that we have not begun at the right end of the work; we have not been working with the young classes of the community and have not been able to follow up our work. We have been doing a little here and a little there, and the results prove that if only we could settle down and continue working incessantly in one place, we would see results that would astonish the people. We need more concentration of effort, more working year in and year out along definite lines. We need a man continually on the spot.

Let us take the case of the Napanee section. The Trustees and Board of Trade have asked for help, and as a native of that section I know the conditions and am particularly interested. Twenty years ago it was one of the

greatest barley growing sections of Ontario. The loss of that industry wrought untold hardship. Recently dairying has revived the agriculture and put new life into the farmers. Now fruit and vegetables are becoming a specialty and one of the largest canning factories of the Province has been erected. That district needs directing along new lines. The High School is open to an instructor. Everything is favorable. There is plenty of land adjacent to the school for experimental grounds. The canning factory is within walking distance. It would pay the people of the town and county ten times over to have an expert there continually and for them to pay for such an expert, but it would seem as though it would be necessary for the Government to prove this by putting the man there. If he does his work well, at the end of three years' work he would have so proven the value of the instruction that there would be no hesitation as to the Board of Trustees assuming the expense of continuing such instruction. The great thing is to get this work started and to get it started right. Further, men cannot be picked up at a moment's notice; they must be selected and directed so as to prepare themselves for it.

Another effect of having these men engaged in this work would be that many students would be directed to the Agriculture College, farmers' sons attending the High School, who would otherwise go into professional or business life, simply because there was some one at hand to give them the bent in the right direction.

Enough has been said, I think, to indicate what might be attempted by thus having located at various points agricultural specialists, who could give agricultural instruction to classes in the High Schools and also carry on special work for the Department of Agriculture.

The question now may be asked as to whether there is anywhere anything to guide us, any example of such work.

In France there are what are known as Departmental Professors of Agriculture. In 1879, a law was passed that within six years a chair of agriculture should be founded in every Department of France. The men are chosen on examination. The salaries and expenses of these Departmental Professors are paid one-half by the Minister of Agriculture, and one-half by the Minister of Public Instruction.

The duties are as follows:

(1) To give agricultural instruction in the Normal Colleges, and, if so required, in other institutions of public instruction.

(2) To hold agricultural conferences in the country districts of the Department.

(3) To undertake special works or missions entrusted to them by the Prefect or the Minister of Agriculture.

There are eighty-seven Departments in France.

The plan I have outlined was suggested to me by a study of this system of France and an acquaintance with the increasing demand of this Province for help along so many lines of agricultural work.

C. C. James.

COURSE IN AGRICULTURE.

By Prof. S. B. McCready, O.A.C., Guelph.

During the year the Provincial Government appropriated $6,000 in order to establish agricultural departments in six of our High Schools. The schools at Essex, Galt, Collingwood, Lindsay, Morrisburg, and Perth were selected as representative centres and six College graduates put in charge.

At the request of President Creelman I prepared a tentative course of study for the Department of Education. In this work I consulted with the College staff at large, and had the help of Professors Zavitz and Hutt in the final revision. The outline was drawn to cover a two years' course, corresponding to the present two years' course in commercial work given in many of our High Schools. It was an adaptation of the course outlined in the Education Department's Regulations of 1904, prepared, I believe, by Messrs. Lochhead, Muldrew, and Mills. The work was, however, stated more specifically and framed in accordance with the experience and work of recently established American Agricultural High Schools. In general content it includes such of the instruction and practice of the first two years of our College as could be taken by one special teacher in an Ontario High School when assisted by the teacher of Science.

The two-year outline was afterwards changed so as to permit of greater freedom in the treatment of the subjects by the teacher. The Education Department's regulations regarding their Agricultural departments are included here with the course of study.

I also prepared at your request for the use of the Department of Education, and as a suggestion teachers and school boards, a list of such equipment as might be ultimately required, with approximate cost of the same. It follows the regulations and course of study.

AGRICULTURAL DEPARTMENTS IN HIGH SCHOOLS AND COLLEGIATE INSTITUTES.

The following courses in Agriculture and the list of apparatus are being considered by the Education Department. In addition to such courses, pupils in the special Agricultural departments will take the subjects that are obligatory on all pupils, with such modifications as may be deemed expedient by the Principal and approved by the Education Department.

Part of the proposed scheme also is that the teacher of Agriculture would take classes in his department in the school, of pupils from the surrounding country, the members of which might not be in regular attendance in the other High School classes; and that, if practicable, he would hold special classes at suitable times in other parts of the county. In addition this teacher would act in the neighborhood as a special agent of the Agricultural College.

I. ACCOMMODATIONS REQUIRED.

A laboratory, school gardens, arboretum, experimental plots.

II. COURSES OF STUDY.

First Year.

Agricultural Physics: To keep records of the weather in standard book supplied by O.A.C. Physics Department, of accidents from lightning; of average temperatures, rainfall, etc., and to report monthly on same to the O.A.C.

Examination and classification of soils; laboratory exercises on elementary physical analyses of school garden or home garden soils; local excursions for the collecting and studying of soils. Pupils should be able to recognize, name and describe the different kinds of soils of the neighborhood.

Laboratory exercises to estimate the water capacity of different soils; to demonstrate capillary force; to show how soil water is conserved and the necessity for conservation; drainage.

Chemistry: Oxygen, hydrogen, nitrogen, carbon; air, water, ammonia, carbon dioxide—a practical course.

Agricultural Botany: Weeds and weed seeds: seed testing for purity according to the rules of the Seed Control Act of 1905. Experiments to show the relations of the plant to the soil, light, air, temperature and moisture.

Study of tree growth.

Plant families of chief economic importance.

Horticulture: Selecting and storing flower and vegetable seeds for next year, Methods of gathering, grading, packing, storing, shipping of fruits; visits to orchards, cold storage plants, canning factories, markets, fruit shows. Treatment of fruit plantations, pruning, spraying, cover-crops.

Propagation by seeds, budding, grafting, layering, cuttings. In the spring, making and keeping of a garden with plots for carrying on some of the experiments of the Experimental Union—such as testing varieties of fruits and vegetables.

Constructing and caring for a hotbed.

Field Husbandry: Experimental plots in the school farm in accordance with Experimental Union; one on cereals, one on fodders, one on root crops.

Germination tests of the selected seeds of common farm plants.

Seed judging; changing seed, quantity of seed per acre.

Animal Husbandry: Visits to local stock farm, to learn best methods of housing, feeding and handling farm animals.

Visits to fairs or stock-sales to become acquainted with different breeds.

Judging of types of farm animals; beef and dairy cattle, light and draft horses, bacon hogs, short and long wool sheep.

Dairy Husbandry: Visits to local cheese factories and creameries to learn, in general, the factory methods of caring for milk, utensils and finished products.

Dairy stables: lighting, cleaning, ventilating.

Individual cow testing: this to be carried on by some of the students at home.

Poultry: Visits to poultry plants, shows, markets. Planning and building poultry houses.

Leading breeds; care and feeding of fowl.

Farm Carpentry: A modification of the ordinary Manual Training course to suit farm boys.

How to use, sharpen, care for such tools as a farmer's kit should contain.

Models of joints, splices necessary in making farm buildings or appliances.

Farm Arithmetic and Beekkeeping, etc.: Practical measurements of land surfaces, wood, stone, walls, tanks, bins, mows, lumber.

Cost of fencing, buildings, silos, feeds.

Study of market reporting in daily papers, local and foreign.

Assessment rolls and methods of fixing tax rate.

Keeping farm accounts of each field.

Second Year.

Agricultural Physics: Soils: Work of first year continued.

Methods of tillage; underdrainage and taking of levels.

Mechanics: Principles of farm machinery; pumps, levers, pulleys, engines.

Principles of ventilation, lighting, draining.

Chemistry: Soils, fertilizers, foods.

Agricultural Botany: Work of first year continued.

Farm Crops: Study and classification of leading cereals, grasses, legumes; diseases and how to recognize and combat.

Forestry: Study of the common trees of the neighborhood; care of a small forest nursery in connection with the school farm; transplanting; reforestation of waste land.

Visits to local saw and planing mills; grades of lumber and prices.

Horticulture: Work of first year continued.

Plant Diseases: Common vegetable and fruit diseases; spraying and fungicides; practice in orchards of neighborhood.

Economic Insects: Study of injurious and beneficial species; insecticides and their application.

Garden Work: Experiments in conjunction with the Experimental Union.
Plant breeding and selection.

Field Husbandry and Farm Management: Systems of rotation; laying out of a farm; mixed farming; special farming; intensive farming; cost of farming operations.
Improvements of soils by fertilizers, manures and clovers demonstrated in experimental plots on the school farm.
Seed selection: Experiments on school plots to show its value.
Plant breeding: Experiments on hybridization on school plots or at home.

Animal Husbandry: Work of first year continued.
Feeds and feeding; rations.
Care of animals in sickness.
Animal physiology.

Dairy Husbandry: Care and feeding of cows; rearing calves.
Chemistry of milk; elementary bacteriological studies of milk.
Milk testing; Babcock testers.
Management of hand separators, barrel churns, butter worker, butter printer.

Poultry: Care and feeding; treatment of common diseases; elementary laboratory study of the embryology of a chick; incubation.
Individual hen records by means of trap nests.

Manual Training: Farm blacksmithing; use and care of iron-working tools; exercises in repairing farm machinery; exercises in making such articles as rings, chain links, harrow teeth, cold chisels; welding and tempering.

Farm Economics: The Agriculture and Arts Act; co-operative associations; commercial law relating to farmers; municipal organizations; forms and contracts.

EQUIPMENT FOR AGRICULTURAL DEPARTMENT IN ONTARIO HIGH SCHOOLS.

NOTE.—It is not intended that the equipment listed below is to be immediately supplied, but, in the development of the work, this list may be used as a guide in the purchasing of the school's needs.

In many cases manufacturers will be found willing to put in equipment for demonstration purposes. In other cases, friends of the school will loan equipment. In any case expensive apparatus should not be bought before there is a certainty of a necessity for it.

The High School, in most cases, will be supplied already with a considerable part of this equipment. Where Manual Training work is organized, there will be no need for any new equipment of tools.

GENERAL REQUIREMENTS.

(1) A cabinet, made on some unit system, with drawers or sections suited to holding herbarium mounts, bird skins, geological specimens, mineralogical specimens, fungous diseases, etc., etc.

(2) A large table with drawer and cupboard facilities, suitable for demonstrating experiments. The projecting top should be heavy and finished to withstand water and chemicals. Where water, gas and electricity are available, these should be put in.

ESTIMATE OF COST OF EQUIPMENT.

NOTE.—It is not intended that every school should have all this equipment; local conditions will determine the extent of such.

General:

Land—amount to be determined by local conditions (one acre might be ample)	.....
Office fittings	.....
Laboratory tables, etc.	$100 00
Collection cabinets, to commence with	50 00
Library	.....

Agricultural Physics:	
For Drainage work	57 45
For Weather work	32 75
For Soil work	16 00
For Mechanics	18 00
Chemistry: Same equipment as used in High Schools.	
Farm and *Garden Work*	80 00
Farm Carpentry and *Blacksmithing*:	
For Farm Metal Work	87 26
For Farm Carpentry Work	42 00
Poultry	40 00
Dairy Husbandry	100 00
Entomology	20 00
Botany	60 00
	$702 46

PHYSICAL EQUIPMENT.

(*Numbers refer to catalogue listing.*)

For Drainage Work.

1 Architect's Dumpy Level, for survey work, complete (5017) (Keuffel & Esser, New York).	$35 00
1 Levelling Rod (6252)	12 00
1 Surveyor's Chain, 66 feet (7786 D)	3 20
or	
1 Surveyor's Chain, 100 feet (7786 B)	3 50
1 Home-made Drainage Level (to be made by teacher) Level, $1.25; Wood, 50c.)	1 75
2 Sets Arrows (7811) ($1 a set)	2 00
	$57 45

For Weather Work.

Box, to be made at school (blueprint showing design may be had at the O.A.C.)	$5 00
1 Standard Rain Gauge (330) (Henry J. Green, Brooklyn, N.Y.)	5 25
1 Maximum Thermometer (34) (Negretti & Zambra, Holborn Viaduct, London, England)	5 25
1 Minimum Thermometer (36) (Negretti & Zambra)	5 25
1 Aneroid Barometer (Special 58) (Henry J. Green), to be provided without symbols "stormy," etc., and adjustable ring	12 00
	$32 75

For Soil Work.

2 dozen Zinc Tubes, with gauze diaphragm 1 inch from bottom, for determining water capacity of soil, 7¼ inch by 1½ inch	3 50
2 dozen Trays for setting above tubes into, 3½ x 2½ in. x 1½ in. deep	2 00
12 Long Glass Tubes (1 inch diameter, 4 feet long)	7 80
1 Rack and Tray for above	1 50
12 Zinc Trays, 7 x 7 in. x 1 in. deep, for showing optimum water content for tillage and spatulas	1 20
	$16 00

AGRICULTURAL PHYSICS.

For Mechanics.

3 Levers, to illustrate principles of levers	$1 50
Set of Weights for use with above, to be fitted with hooks for attachment to levers or pulleys; 6 of each, ½ oz., 1 oz., 2 oz., 4 oz., 8 oz., 1 lb., 2lb., 3 lb., 5 lb. (Eimer & Amend)	7 50
Set of Pulleys, such as used at O.A.C., Guelph (H. A. Clemens Co., Guelph)	7 50
Model of ordinary pump	75
Model of pressure pump	75
	$18 00

For Farm and Garden Work.

1 Small Scales, weighing ½ oz. up to 240 lbs.	$9 00
1 Truck Scale	.....
1 Grain Tester, gallon (W. & J. G. Greey, Toronto)	20 00
1 Set Grain Measures, ½ bushel, 1 peck, 1 gal., 1 qt., 1 pt.	2 50
1 doz. Germinating Boxes, to be made by students, standard size used at O.A.C., suitable for 100 seeds	1 50
1 doz. Zurich Germinators	60
2 doz. Plates for seed testing	1 20
1 Set of Sieves (15) perforated zinc, as per standard at O.A.C.	3 75
1 Air-tight Box, for killing pea-weevils, grain insects, to be made at school	50
1 5-gal. Crock for treating wheat, oats, etc., for smut	50
Collection of grains, vegetables, tree seeds, weed seeds, etc., to be made at school	.....
1 Dominion Government Seed Collection	2 00
1 Hand Seed Drill (Planet Junior or New Model)	7 00
1 Hand Wheel Hoe (Planet Junior or Iron Age)	7 00
Spades, Digging Fork, Hoes (Draw or Dutch), Rakes, (flat backed steel), Trowels, Hand Weeders, Garden Line and Reel, Stakes and Labels, Mallet	25 00
	$80 55

For Farm Metal Work.

1 Grindstone, 24 x 3 in. in iron frame	$28 00
1 Anvil, 100 lbs. (Peter Wright)	11 00
1 Small Portable Forge	8 50
1 Ballpein Hammer, 1½ lb.	85
1 Ballpein Hammer, 1¼ lbs.	75
1 pair Flat Tongs	70
1 pair Forging Tongs	80
1 pair Belt Tongs	75
1 pair Gad Tongs	65
1 pair Pick-up Tongs	70
1 Hot Set	65
1 Cold Set	65
1 Hardy	48
1 Swage, top and bottom, ¼ inch and ½ inch iron	65
1 Set Flatterers, 2 inch square	65
1 Top and Bottom Fuller, ½ inch	65
1 Set Punches, ⅜ inch and ½ inch, round	50
1 Set Punches, ⅜ inch and ½ inch, square	50
1 Set Flat Chisels, ½ in., ¾ in.	80
1 7-inch Beck Iron	1 25
1 Set Cold Chisels (1) flat (1) cape	1 00
1 Adjustable Hack Saw, and set of blades	2 00
1 Small Hand Drill	8 00
1 Set S. S. Drills for above, ⅛, 3-16, ¼, ⅜, ½, ⅝ inch	1 00
1 Calipers, outside, 5 inch	55
1 Calipers, inside, 5 inch	55
1 Steel Blacksmith's Square for forge work	85
1 Machinist's Steel Rule	85
1 Rivetting Hammer	50
1 Soldering Iron and Solder	50
1 Set Files, 8 in. half-round bastard, 8 in. half-round smooth, 8 in. flat, 10 in. square, bastard, 10 in. half-round	85
1 Screw Plate (Diamond No. C)	4 00
1 Pair Cutting Pliers	88
1 Vise, 4-inch jaws	6 25
	$87 26

For Farm Carpentry.

Bench and Vise	$10 00
Cutting Tools.—	
Saws:	
Rip Saw	1 40
Keyhole, Compass or Turning Saw	40
Back or Tenon Saw	1 25

Panel	1 00
Metal Saw	35
Chisels:	
¼ in. Socket Mortice Chisel	25
⅜ in. Socket Mortice Chisel	30
½ in. Socket Mortice Chisel	35
¾ in. Socket Mortice Chisel	40
1¼ in. Socket Mortice Chisel	55
¾ in. Bevelled-edge Firmer	28
Cold Chisel	5
Planes:	
Jack Plane	1 25
Block or Hand Plane	65
Spokeshave	30
Files:	
Saw, triangular or three-cornered file	10
10 in. half-round	30
8 in. Flat or Mill-saw File	15
¼ in. Round or Rat-tail	15
Boring Tools:	
¼ in. Auger Bit	15
⅜ in. Auger Bit	18
Gimlet Bit	8
Auger Bits, ¼ in., ⅜ in., ½ in., 9-16 in., ⅝ in., ¾ in., ⅞ in., 1 in.	2 25
Drill	18
Shears:	
Tinman's Shears	1 00
Cutting Pliers	75
Scissors	75
Marking Tools:	
Tape Measure	2 25
Land Chain	3 30
Marking Gauge	15
Mortice Gauge	60
Scratch or Marking Awl	15
Compasses	40
Testing Tools:	
Try Square	35
Framing Square	1 25
Bevel	35
Level	75
Holding Tools:	
Iron Bench Vise	45
Ratchet Brace	1 50
Monkey-wrench	45
Small Screw-driver	20
Screw-driver or Turnscrew (large)	30
Screw-driver bit	10
Pliers	75
Driving Tools:	
Hammer (claw)	50
Rivetting Hammer	50
Mallet	35
Nail Set or Punch	15
Saw Set	50
Miscellaneous Tools:	
Oil-stone	40
Oil can	5
Putty Knife	15
Belt Punch	10
Glass Cutter	35
Sloyd Knife	35
Can-opener	10
Wad Punch	15

Single Bench Tool Kit.

Summary:	
Cutting Tools	$15 05
Marking Tools	6 85

Testing Tools	2 70
Holding Tools	3 75
Driving Tools	2 00
Miscellaneous	1 65
Bench and Vise	10 00
Total Cost	$42 00

For Dairy Work.

	Probable cost.
1 Barrel or Box Churn, size to suit herd	$3 50 to $7 00
1 Lever or Roller Worker	2 00 to 5 00
1 Butter Mould, size one to two pounds	45 to 3 00
1 Shipping Box, with icebox in centre and wooden trays	3 00 to 4 50
1 Thermometer (glass)	20 to 50
1 Salt Sieve (hair)	30 to 75
1 Pair Scales, to weigh quarter ounces	3 50 to 5 00
1 Buttermilk Strainer, size 2 to 4 quarts, with perforated tin bottom.	25 to 50
1 Butter Ladle	20 to 40
1 Cream Pail (tin, with handles on sides and tin stirring spoon)...	1 00 to 1 50
Creamer Cans and box for cold water (8 cows)	5 00 to 20 00
1 Cream Separator (10 or more cows)	60 00 to 75 00
1 Brush for cleaning utensils	20 to 30
1 Supply of Washing Soda or Borax	.....
A Supply of good Butter Salt, per sack	70 to 1 60
Butter Color, if thought advisable to use it, per bottle or per gallon.	25 and 3 50
Parchment Butter Paper, per 1,000 sheets	1 00
Babcock Milk Tester (8 bottles)	1 00
Lactometer (Quevenne)	1 50
1 Cow Testing Outfit, such as recommended in Bulletin 12, Dominion Department of Agriculture. There is a probability that the schools may be supplied with these free.	
1 Straightspring Scale (Fig. 1), capacity 40 lbs.	1 25
1 Sample Bottle for each cow (Fig. 3), each	6 to 10
1 Sample Dipper (Fig. 4), each	10
1 Box for holding samples (Fig. 5), each	75
1 Package of 500 Preservative Tablets	75
	$100 00

For Work in Entomology.

(Much of this equipment can be prepared at school.)	
Killing Bottles, Insect Boxes, Insect Nets, Insect Pins, Insect Spreading Boards, Breeding Cage, Insect Labels, Insect Larva Bottles, Cork	$20 00

For Poultry Work.

1 Incubator	$30 00
1 Brooder	10 00
Models of trap nests, hen houses, etc., to be made by students.	.....

For Work in Botany.

1 Compound Microscope, 2 objectives	$35 00
Plant Collecting Cans, Magnifying Glasses, Forceps, Razors, Needles, Glass Slides, Cover Glasses, Herbarium Mounts, Labels, Bell Jars, Beakers, etc.	25 00

AGRICULTURAL DEPARTMENTS IN HIGH SCHOOLS AND COLLEGIATE INSTITUTES.

Regulations for Sept. 1907, to July, 1908.

Admission Requirements.

1. Pupils who take the regular two years' Special Course in Agriculture or a partial course therein in a High School, shall be admitted in accordance with the regulations that govern the admission of other High School pupils. For 1907, to 1908, however, other pupils may be admitted who, in the opinion of the Principal of the School and the Public School Inspector, are competent to take up the work. All such pupils shall be regarded as regularly enrolled.

2. To the courses held throughout the county, such persons may be admitted as, in the judgment of the teacher of Agriculture, are competent for the work, whether, for example, farmers or farmers' sons or daughters, or pupils of Public Schools or of other High Schools. A list thereof and their reported attendance shall be kept by the Principal of the school; but they shall not be enrolled as regular High School pupils unless they have been admitted to a High School as provided above.

Qualifications of Teachers.

3. The teacher of Agriculture in a High School shall hold the degree of B.S.A. from the University of Toronto, or a certificate of qualification from the Ontario Agricultural College. Such teachers may also take part in the Science work of the school at the discretion of the Principal, provided such work does not in any way interfere with their special work as teachers of Agriculture.

Duties of Teachers.

4. Like the other members of the High School staff, the teacher of Agriculture shall be generally subject to the authority of the Board and Principal of the High School, the latter of whom shall control his time-table and have the general direction of his movements.

5. With a view to bringing the Department of Agriculture into closer touch with the farming community and of making it more directly beneficial to them, the teacher of Agriculture shall also act as the local agent of the Department of Agriculture for the district, as follows:

(*a*) He shall visit from time to time the various parts of the county and report upon their special requirements.

(*b*) He shall take charge of an office situated in the High School district, where he may meet the farmers, giving them aid and advice, supplying them with the bulletins of the Department of Agriculture and such other farm literature as may be useful, and discussing with them the latest experimental results of the work of the Ontario Agricultural College.

(*c*) He shall keep in touch with local Agricultural Associations, Farmers' Institutes, etc., and shall act in concert with the staff of lecturers, demonstrators, and professors of the Ontario Agricultural College.

(*d*) Where practicable, he will arrange for excursions for students and others to the Agricultural College in the month of June, and shall take special charge during such visits of those who have been in attendance on his classes.

(*e*) He shall attend the Winter Fair and annual meeting of the Experimental Union, held yearly in Guelph for one week in December.

Accommodations and Equipment.

6. A suitable Laboratory and the Equipment necessary to carry out the work as outlined under Chemistry, Physics, and Biology.

Experimental Grounds, separate from the ordinary School Grounds, for illustration purposes in the growing of various classes of farm crops and training in experimental work. The area of the grounds will be determined by local conditions; one acre might be sufficient.

A list of suitable equipment from which Boards may select has been prepared and may be obtained on application to the Education Department.

Inspection.

7. The Agricultural Department of each High School or Collegiate Institute shall be inspected at least once each year by an officer of the Ontario Agricultural College deputed for this purpose by the Minister of Education. This officer shall report to both the Department of Education and the Department of Agriculture.

Courses of Study.

8. The regular Special Course in Agriculture in a High School shall be the two years' one, as defined below. Partial courses may also be provided in the High School for regular High School pupils or for such occasional pupils as may desire them.

9. Regular High School pupils taking the special course in Agriculture shall take in addition the subjects which are obligatory upon all High School pupils, namely, Geography, Arithmetic and Mensuration, English Grammar, Writing, Reading, English Composition, English Literature, and History, with such suitable modifications of

this course, and with such additional subjects, as may be deemed expedient by the Principal and the parent or guardian of the pupil. [See Reg. 39, (4) and (6), of 1904.]

10. It is not intended that all the work outlined in the course below shall be covered in two years. The outline is suggestive rather than obligatory, and the amount of work to be taken up shall be determined by the needs of the community, and the nature of the special subjects selected. In some districts, Horticultural subjects, for example, will receive special emphasis, in others, Dairying, and, in others again, Stock raising, and so on.

11. In addition to the regular Special High School Course, partial courses shall be provided, when needed, in the High School and in other parts of the county, of such duration and character as may meet the needs of the farming community. These may include short courses in Horticulture; Soils, Seeds, Weeds, Farm Dairying, Poultry keeping, etc., as well as demonstrations and lectures in particular subjects (Stock judging, Seed judging, etc.) at one or more meetings at suitable centres. In these courses the teacher of Agriculture will be assisted, when necessary, by members of the staff of the Ontario Agricultural College, and he will be supplied by the College with abundant material for demonstration purposes.

12. High School pupils who take the two years' Special Course herein provided, and whose competency is attested by the Principal of the school and the teacher of Agriculture, shall be eligible for entrance to the Second Year work of the Ontario Agricultural College.

13. The following is the regular two years' Special Course, to be organized in accordance with the requirements of each locality:

(1) *Field Husbandry.*—History of agriculture; different systems of farming; different kinds of soil; rotation of crops; farm crops in their relation to drainage; application of manures; green manuring; preparation of the land for the different crops; methods of cleaning, testing, and selecting farm seeds; study of cereals, roots, fodder crops, grasses, clovers, and other farm crops; sowing, harvesting, preserving, marketing.

Experimental grounds near the school will be used for illustrative experiments with varieties of cereals, grasses, root crops, and in seed selection, methods of cultivation, rotation of crops, and the use of various kinds of fertilizers.

(2) *Animal Husbandry.*—A study of the history and characteristics of the principal breeds of live stock, including light and heavy horses, beef and dairy cattle, sheep, and swine; feeding and management; principles of breeding; registration of pedigrees; market requirements.

Visits to local farms, and practical work in judging stock.

(3) *Dairy Husbandry.*—The herd; formation, care, and management of a dairy herd, rearing of calves; dairy stables: lighting, cleaning and ventilating; individual cow records. The milk: care of milk, elementary chemical and bacteriological study of milk. The home dairy: running of hand separators and care of dairy utensils; manufacture, packing, and marketing of butter.

Visits to local creameries and cheese factories, and a study of factory methods of manufacture, packing, and marketing.

(4) *Poultry.*—The most valuable breeds and varieties of hens, ducks, geese and turkeys, their characteristic points and peculiarities; various methods of housing poultry; incubation, brooding, and rearing of chickens; general methods of feeding and management; market conditions; the fattening and dressing of poultry for home and foreign markets.

(5) *Horticulture.*—Treatment of fruit plantations: cultivation, grafting, spraying; value of cover crops; methods of growing and caring for vegetables; selection of varieties; study of insect and fungus diseases affecting fruits and vegetables; care, storing, and marketing of fruit.

(6) *Forestry.*—Forestry as related to the farm; classification of the common forest trees; the establishment, care, and protection of the wood lot; varieties and methods for roadside planting and shelter belts.

(7) *Agricultural Botany.*—Identification and eradication of weeds and weed seeds; Seed Control Act and its application; experiments to show seed germination and growth of plants; the relation of plants to soil, air, light, temperature, and moisture; systematic study of the structure of cereals, grasses, legumes, and roots; plant diseases: smut, rust, mildew, etc.; how to recognize and combat them; collecting, pressing, and mounting of weeds, grasses; weed seeds for samples in identification.

(8) *Entomology.*—A practical course in economic insects, identification, habits, and life histories; a close study of the more important insects, by means of breeding and rearing cages; insecticides; collecting of injurious and beneficial insects and samples of their work.

(9) *Agricultural Physics.*—Soil: classification and physical examination, origin, and mode of formation; soil forming, soil forming rocks and minerals; behaviour towards moisture. Surveying and drainage: measurement of fields and farms with the chain; calculating areas and drawing plans; use of various instruments for determining levels; preparing plans for drainage; methods of digging, laying of tile, and filling of trench; calculations concerning required size of tile and cost of various systems. Conservation of moisture by drainage, mulching, and cultivation; capillarity and its relation to plant growth. Water capacity of different soils. Mechanics: principles of farm machinery; principles of ventilation, lighting, and heating.

(10) *Agricultural Chemistry.*—Chemical composition of soils; elements used by plants; availability and assimilation of plant food in the soil; application of fertilizers; absorption and retention of important constituents, as nitrogen, phosphoric acid, and potash; insecticides and fungicides; their composition and proper mixture.

THIRTY-NINTH ANNUAL REPORT

OF THE

Fruit Growers' Association

OF

Ontario

1907

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO).

PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty,
1908.

WARWICK BRO'S & RUTTER, Limited, Printers,
TORONTO.

To the Honourable SIR WILLIAM MORTIMER CLARK, K.C.,
Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOUR:

I have the pleasure to present herewith for the consideration of your Honour the Report of the Ontario Fruit Growers' Association for 1907.

Respectfully submitted,

NELSON MONTEITH,

Minister of Agriculture.

TORONTO, 1908.

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Fruit Growers' Association of Ontario.

OFFICERS FOR 1908 :

President ..... A. W. PEART, Burlington.
Vice-President ..... E. D. SMITH, Winona.
Secretary-Treasurer ..... P. W. HODGETTS, Parliament Buildings, Toronto.

DIRECTORS :

Division No. 1.—R. B. WHYTE, Ottawa.
" 2.—A. D. HARKNESS, Irena.
" 3.—F. S. WALLBRIDGE, Belleville.
" 4.—WM. RICKARD, Newcastle.
" 5.—R. W. GRIERSON, Oshawa.
" 6.—A. W. PEART, Burlington.
" 7.—E. D. SMITH, Winona.
" 8.—G. A. ROBERTSON, St. Catharines.
" 9.—J. E. JOHNSON, Simcoe.
" 10.—D. JOHNSON, Forest.
" 11.—A. E. SHERRINGTON, Walkerton.
" 12.—C. W. GURNEY, Paris.
" 13.—C. L. STEPHENS, Orillia.

Ontario Agricultural College : Prof. H. L. HUTT, Guelph.
Honorary Directors : THOS. BEALL, Lindsay ; A. M. SMITH, St. Catharines ; W. T. MACOUN, Ottawa.
Auditor : J. M. DUFF, Guelph.

REPRESENTATIVES TO FAIR BOARDS AND CONVENTIONS :

London : D. JOHNSON, Forest ; C. W. GURNEY, Paris.
Ottawa : R. B. WHYTE, Ottawa ; HAROLD JONES, Maitland.
Toronto : W. H. BUNTING, St. Catharines ; P. W. HODGETTS, Toronto.
Ontario Horticultural Exhibition : W. H. BUNTING, St. Catharines ; A. W. PEART, Burlington ; E. LICK, Oshawa ; P. W. HODGETTS, Toronto.
Michigan Horticultural Society : A. W. PEART, Burlington.
Quebec Pomological Society : HAROLD JONES, Maitland.
Western New York Horticultural Society : ROBT. THOMPSON, St. Catharines.

COMMITTEES :

Executive : President, Vice-President and Secretary, with JAS. E. JOHNSON, Simcoe, and ELMER LICK, Oshawa.
Transportation : W. H. BUNTING, St. Catharines ; J. L. HAMILTON, Clarkson ; R. W. GRIERSON, Oshawa ; E. D. SMITH, Winona ; R. J. GRAHAM, Belleville ; WM. RANDALL, Grimsby ; J. L. HILBORN, Leamington, and the Secretary.
Co-operation : JAS. E. JOHNSON, Simcoe ; ELMER LICK, Oshawa ; ROBT. THOMPSON, St. Catharines ; C. L. STEPHENS, Orillia ; A. E. SHERRINGTON, Walkerton, and D. JOHNSON, Forest.
New Fruits : Prof. H. L. HUTT, Guelph ; W. T. MACOUN, Ottawa, and E. D. SMITH, Winona.
Historical : A. MCNEILL, Ottawa ; L. WOOLVERTON, Grimsby ; HAROLD JONES, Maitland ; W. T. MACOUN, Ottawa ; W. DEMPSEY, Trenton.

Fruit Growers' Association of Ontario.

ANNUAL MEETING.

The forty-eighth annual meeting of the Fruit Growers' Association of Ontario was held in Victoria Hall, Toronto, on the 14th and 15th of November, 1907.

The Branch Associations were represented to a larger extent than usual, and the proceedings generally were of a most interesting and instructive nature. The President, Mr. Harold Jones, occupied the chair in an efficient manner.

REPORT OF EXECUTIVE FOR 1907.

Owing to the change in the Association year, by which the new Board of Directors does not meet until January, the work of the present Executive does not terminate until the end of December. This report will, therefore, cover part of the year only, the full report being presented to the new Board according to the constitution. The responsibility for the successful carrying out of the Fruit Show and the annual meeting, now rests wholly upon the present Executive and Board instead of as formerly being divided between the incoming and outgoing Board. This is one of the good features resulting from the changes in the constitution at the last annual meeting.

Membership.

The lowering of the affiliation fee for co-operative and other fruit growing associations has not brought the increase in membership that it should have done. While the total for 1907 is 537, being 103 in excess of that for 1906 (434), there are still a large number of the co-operative associations not represented. The membership of 537 is made up as follows:

Associations.

St. Catharines	110	Burlington	36
Clarkson	69	Oshawa	57
Forest	12	Belleville	35
Arkona	21	Norfolk	43
Niagara District	25	Kingsville	33
Orillia	7		

Single memberships, 124.

The Board will note that many of our strongest assiciations are thus not represented. The changes in the constitution were brought to the attention of the secretaries at least twice during the year, and they are urged to take advantage of the lower affiliation fee. In the case of one of the largest, the matter was very clearly explained to them from the Department itself, but nothing was done in the matter. The causes for this state of affairs should be thoughtfully examined, and if possible some remedy should be

devised. One explanation given is that certain districts are over-represented, while others largely interested in fruit growing have no representatives.

This question will have to be settled in the near future and the grievance removed. Great trouble at once arises in ascertaining as to the extent to which fruit growing is at present carried on in the various counties, and also as to the probable increase in orchard acreage likely to occur in the next half century or less. According to the Bureau of Industries Report, 1905, the divisions are represented in acreage as follows:—

	Bureau Reports (Apple trees only).		Census Reports 1901. (All fruit trees).
Division 1	347		335
2	321		360
3	420		345
4	972		1,080
5	1,346		1,246
6	896		1,227
7	942	Small fruits, 2,025 acres. Grapes, 3,237 acres.	2,312 (includes Wentworth)
8	631	Small fruits, 1,167 acres. Grapes, 6420 acres.	1,615
9	840		1,622
10	1,257		1,792
11	647		980
12	1,034		1,609
13	500		632

Trouble at once arises, however, from the fact that the Ontario reports give only apple trees, which tends to make them rather confusing for our purpose. A comparison with the Dominion census reports shows that the figures are reliable, except in the counties raising the tender fruits in large quantities. Here allowance must be made also for the large acreages of small fruits and grapes.

Another important point is that while some of the western counties are shown with large acreages, the orchards are old and scattered, neglected, and of course, unprofitable. Many single townships in the east produce as much saleable fruit as whole counties in the central west which may figure large in the Government reports. By thorough investigation, however, much data could be arrived at which would give a fair idea of the possibilities of the various districts. One change has been already suggested in regard to the extreme east which seems feasible. This is to divide the counties from Kingston east into two districts instead of three as at present, one embracing the counties along the Ottawa Valley and the other the St. Lawrence Valley counties, thus alloting two directors to these counties instead of three as at present. The counties of Lincoln and Wentworth could then be given one director each. This seems consistent with the extent of the industry in these counties. Further changes are shown on the accompanying map.

A further slight re-arrangement of the southern and central-western districts would seem desirable in view of the fruit conditions now known to exist there. That some changes are deemed necessary is shown by the decided action of the fruit growers in the counties of Wentworth and Halton this spring in bringing the matter to the attention of the Department of Agriculture. The re-arrangement mentioned above would give, in thousands of apple trees, Div. 1, 420; Div. 2, 474; Div. 6, 603, including 1,303 acres small fruits and grapes; Div. 7, 1,196, plus 3,959 acres small fruits and grapes; Div. 8, 1,077, plus 5,930 acres small fruits and grapes; Div. 9, 1,540; Div. 10, 1,609; Div. 11, 1,736; Div. 12, 1,593; Div. 13, 1,349.

Committees.

The standing committees present their own reports to-morrow morning. The co-operative committee has probably been the most active during the year, and through its work has assisted materially the associations already in existence. A large number of meetings were held in the spring and a few new associations were organized. It seems difficult, even in a good year such as this has been, for the orchard owners to get them sufficiently aroused to take hold of the work. As an Association we must keep hammering away in all the fruit growing counties, showing results, and coaxing the growers to wake up to their opportunities. The work is slow, and there are many difficulties to overcome before even those associations already in existence are sure of the future.

The Industrial Exhibition committee has at last been rewarded for their years of agitation for a new building. One of the finest buildings now on the grounds of the Exhibition Association was completed this year and set apart for agriculture. One wing and a portion of the main hall were reserved for fruit, and it is to be regretted that owing to the lateness of the season, the showing was such a poor one. The grapes, especially, were decidedly off color, and gave a wrong impression of this branch of fruit growing to the thousands of visitors who passed through the buildings each day.

In connection with the prize list, several further changes were recommended by your committee as follows:—

1. A fourth prize in all sections. This was granted only in boxes and barrels, commercial class.

2. Prizes made uniform for plates of fruit, except grapes, where an increase of 50c. all round was suggested. Granted in full.

3. The addition of 19 new sections in the commercial package class, chiefly display baskets. Granted in full.

4. The large collection to be allotted 3 prizes of increased value. Granted.

5. Several small changes of varieties and prizes. Granted.

Horticultural Exhibitions of 1906 and 1907.

A draft statement of last year's financial standing of the Show Committee was submitted to this Board in January. The deficit was about $900, a slight increase over that of 1905. It was pointed out then that, comparatively, the receipts were about $2,000 more than in 1905, as the expenditure, including the band, was about $2,000 greater. A full statement of the growth of the Show and the great good that was accruing from it in all its branches was carefully prepared and submitted to the Minister of Agriculture early in the session. A strong deputation representing the various industries interested presented their views on this matter, with the request that the grant to the Show be largely increased. This was favorably received by the Legislature, and a grant of $2,000 was given for this year. Part of this money was used for paying the deficit of 1906, and the present Show starts with a clean sheet and about $1,000 in cash. The city of Toronto gives $750, and the various associations interested various amounts. Your Executive has promised $300, the same amount as contributed in 1906.

This year's committee reorganized early in the summer and re-elected last year's officers with the hope that the experience gained in the last show would enable them to carry this year's exhibition to a successful conclusion.

Plans have been carefully made for the exhibits in the various branches, for music by the regimental bands of the city, and for a special hanging garden in the centre of the hall. When assembled, this year should prove the most attractive of the four held to date. If the attendance is as large as last year, a better financial statement should result, as the expenditure should be at least $1,000 less.

The one drawback to Massey Hall is that of having to divide the show between the two floors, and even then being crowded for room. Inquiry was made this summer as to the use of the St. Lawrence Market Arena, which seemed admirably suited for such a show. While the building could have been secured from the city free of charge, the cost of heating would have been so great as to preclude any idea that the committee may have had as to its use.

In regard to the fruit prize list, after consulting the Directors, it was decided to make no change until the finances of the Show should warrant our doing so, by increasing the varieties and the prizes. The entries compare favorably with those of 1906 despite the high prices which would naturally affect the entries in the commercial packages. The entries are made up as follows:—

Class 1,	Barrels, apples	50	Class 7,	Boxes, pears	29
	Boxes, apples	120	Class 8,	Plates, Grapes	25
Class 2,	Barrels, apples	33		Baskets, grapes	18
	Boxes, apples	31	Class 9,	Collections	7
Class 3,	Plates, apples	177	Class 10,	Preserves.	
Class 4,	Plates, apples	177	Class 11,	Jams.	
Class 5,	Pyramids, apples	59	Class 12,	Jellies.	
Class 6,	Plates, pears	65	Class 13.	Grape juice.	

In class 9, it would seem desirable to either sub-divide these sections or restrict one section to apples only. At present the southern districts are the only ones able to secure the tender fruits which go far to make the exhibits more attractive than those from the apple sections. Competition is limited to such an extent that it is extremely difficult to secure entries.

County Prize Scheme.

This work has been carried on again this year with the result that seventeen counties have entered. Seven of last year's dropped out, including Lincoln, Grey, Bruce, Kent, Ontario and Hastings; while Huron, Elgin, Wentworth and Peel came in, leaving a total of three less than in 1906. It is very difficult to get the growers in some of the best counties interested. This doubtless accounted for those dropping out. It would be too expensive to advertise in the papers in each county, and the distribution of the prize lists, together with such notices as the press will contribute voluntarily seem to be the only channels available. As a whole, this collection is one of the best in the Show, but the competition in some of the individual counties is yet poor. If some schemes could be worked out whereby the same or a better display could be procured from each county without so much cost, and perhaps doing away with the competition in each county, the same display would follow here, and the county councils might take a greater interest in them. Worthy exhibits could be awarded medals or diplomas.

American Pomological Society and 50th Anniversary.

This year's meeting is the 48th annual gathering of the Association. In 1909 we hope to fittingly celebrate our 50th anniversary. It has been brought to our attention that there would be a possibility of the American Pomological Society meeting in Canada at that time if an invitation were sent to them in advance. In this connection we would suggest that both matters be brought to the attention of the members, and, if satisfactory, a strong invitation be sent a once to their secretary, backed up by personal invitations from all those of our members who have any influence with that Society. At the same time a committee should be appointed now to make arrangements for a joint celebration.

Legislation.

In accordance with last year's resolution *re* fruit packages, which was forwarded to the Hon. Mr. Fisher, the Dominion Government finally amended the Inspection and Sale Act by stating definitely the dimensions of the 15, 11, and 6 quart baskets. Other sizes, except the berry boxes and the 2 2-5 qt. baskets, must be stamped to be legal. This should finally settle part of this vexed question. The British Columbia growers are not satisfied with the berry box, and intend to continue the agitation for further change.

In reference to the proposed nursery control law which was so thoroughly discussed last year, nothing definite was arrived at, and the Department decided that until some practicable scheme could be proposed, nothing further would be done in the matter. To give the growers as much information as possible, your Executive have asked Mr. G. A. Robertson, of St. Catharines, and Mr. E. C. Morris, of Brown's Nurseries, to discuss the subject at the convention.

Another matter partly disposed of at our last gathering, namely, that of scale infected fruit, has caused some alarm this year. The papers were full of the detention of several cars of diseased fruit a short time ago at Grimsby. At the same time a large number of cars were received at St. Catharines, Simcoe, Waterford and Delhi. Entomologists state that there is no danger of infection from scaly fruit, but the Department believes that there is no need in tempting Providence in a case of this kind. Prompt measures were taken to scald the fruit and disinfect as many cars as could be found. The Ontario San José Scale Act forbids the importation or holding of such fruit, but owing to the expressed views of many of our growers, the law has not been enforced except upon requests such as came in the Grimsby case.

A more serious matter is that of the exportation of apples marked with the scale. In some sections this year, apples have been barrelled in orchards where no attempt was made to spray, and where it was hard to find an apple free from the insect. Such fruit, if exported to Great Britain and Europe, would do more to shut us out of our markets than the highest tariff in the world.

A further revision of the San José Scale Act was made by the Legislature at the last session, as follows:—

"Upon the report of the Inspector to the council that there is scale upon the trees or shrubs on any lot within the municipality, the council may

direct that notice be given personally by the inspector, or, by being sent by registered letter, to the owner or occupant of the lot, to have the trees or shrubs forthwith sprayed; and in case the same are not sprayed within 10 days, the inspector may cause the spraying to be done, and the cost of same shall be charged on the lot and be collected as a special tax in addition to other taxes imposed by the municipal council on the lot."

This amendment was made owing to the fact that in a number of cases where municipalities and the growers residing therein were making an earnest effort to overcome the scale, some one or two parties would neglect their premises or absolutely refuse to treat the trees, proving a great menace to the neighboring premises.

Fruit Exhibitions.

Representations having been made to the Minister of Agriculture for the Province of Ontario that something should be done to hold and increase our markets for our fruits, your Secretary was delegated by the Minister to get together an exhibit for Winnipeg Industrial. As the fruit was then all in storage (November 30), the task was slow and difficult, but some seventy bushels were finally gathered and held in cold storage until July 10th. The apples were then expressed to Winnipeg and came out for exhibition in remarkably fine condition. In addition to the apples, some cherries, tomatoes, and cucumbers in the natural state, and other fruits in preservatives, made up an exhibit that Ontario might well be proud of. In cherries we were outclassed by British Columbia, but in the other fruits we were far in the lead. Many remarks were made as to our being so long in making an exhibit, and many former residents of the Province gave us a glad welcome.

TREASURER'S REPORT FOR 14 MONTHS ENDING DECEMBER 31, 1907.

Receipts.		*Expenditures.*	
Balance on hand, Dec. 31, 1907	$1,008 28	Show	$1,853 10
Fees	204 30	Horticulturist	200 50
Show	966 44	Annual meeting	504 69
Legislative grant	1,700 00	Committees	275 00
County councils	215 00	Postage	120 90
Sundries	110 59	Audit	8 00
		Salaries	70 00
		Incidentals	98 35
		Balance on hand Dec. 31, 1907	1,074 07
	$4,204 61		$4,204 61

Details of Expenditure.

(County Prizes.)

Show:

Refunds to Treasurers	(1906)	$16 70	
Prize money	(1906)	123 60	
Refunds to Treasurers	(1907)	38 15	
Prize money	(1907)	140 05	
			$318 50

Grant to show, $300; balance of prizes, $125.44		425 44
Fruit sold (1906), $193.05; (1907), $305.55		498 60
Storage and freight (1906), $56.52; (1907), $167.34		223 86
Labor (1906), $88.00; (1907), $167.50		255 50
Judges (1906), $20.20		20 20
Advertising		11 00
Express and incidental express (1906)		100 00
Total for show		$1,853 10
Horticulturist:		
Periodicals		200 50
Annual Meeting:		
Reporting, 1906 and 1907		100 00
Annual meeting, travelling expenses, 1906, P. J. Parrott, $24.05; G. N. W. Telegraph, $4.19; C. F. Hale, $28.80; G. C. Caston, $7.70; W. H. Bunting, $13.40; Forest, F. G. A., $2.30; R. B. Whyte, $20.20; Methodist Book Room, printing programmes, etc., $20.25; Wm. Rickard, $8.30; E. Morris, $7.45; H. H. Groff, $10.80; E. Lick, $6.35; A. M. Smith, $5.60; Geo. A. Gott, $2.20; A. W. Peart, $1.85; H. L. Hutt, $10.00; Jas. S. Scarff, $9.50; J. L. Hilborn, $13.45; A. D. Harkness, $15.45; C. Potter, $7.00; H. Jones, $8.00; M. Pettit, $8.45; Thos. Beall, $5.90; Oakville F. G. A., $1.10; W. H. Dempsey, $5.95.		$248 34
Travelling expenses, annual meeting, 1907, A. D. Hopkins, $13.15; R. Thompson, $10.90; F. S. Wallbridge, $3.60; W. E. A. Peer, $1.05; A. Lawrie, $4.50; M. G. Bruner, $15.35; E. Lick, $3.40; C. Fisher, $10.20; A. E. Sherrington, $3.50; Wm. Rickard, $1.85; Jas. E. Johnson, $2.90; E. Boughner, $2.90; A. D. Harkness, $9.45; A. A. Wright, $6.00; G. A. Robertson, $2.50; D. Johnson, $4.50; rent of Victoria Hall, $30.00; T. Eaton Co., decorating Victoria Hall, $10.00; Wm. Briggs, programmes, $14.00; C. Potter, $6.60		156 35
Total for annual meeting and reporting		$504 69
Committees:		
Travelling expenses (1906), Jas. Scarff, $19.50; M. Pettit, $3.20; T. S. Hill, $6.25; W. H. Bunting, $11.30		$40 25
Travelling expenses (1907), G. A. Robertson, $4.45; A. O. Telfer, $8.55; H. H. Groff, $7.70; E. Lick, $2.55; A. D. Harkness, $17.40; D. Johnson, $28.85; C. L. Stephens, $8.70; A. E. Sherrington, $20.25; A. W. Peart, $7.75; W. H. Dempsey, $15.00; A. A. Wright, $6.60; W. D. A. Ross, $7.90; Harold Jones, $23.75; Wm. Rickard, $8.10; W. H. Bunting, $67.20		234 75
Total expenses Committees		275 00
Postage and Stationery:		
Printing Score Card tags and cards, Methodist Book Room, Printing, etc., $25.75, (1906), Mrs. Hubertus, postage, $15.00; from cash, 50c.; Methodist Book Room, $8.00; (letterheads and envelopes), Mrs. Hubertus, postage, $15.00; printing, Might Directories, $7.30; Methodist Book Room (envelopes), $5.75; printing county prizes, $40.60; printing cards, $2.50; postage from cash 50c.		120 90
Audit:		
J. M. Duff, $8.00		8 00
Salaries:		
1906, A. M. Fox, $20.00; P. W. Hodgetts, $50.00 (2 months)		70 00
Incidentals:		
1906, J. Myers & Son, $1.98 (hoops); Hale Bros., $1.85; C. P. R. Telegraph, $1.25; (1907), Bank of Commerce, 15c.; expenses of advertising Hort. meetings, J. F. Goodfellow, $2.10; Ed. Thomas, $2.60; E. Brien, $8.56; L. B. Davidson, $2.45; Arthur Prain, $4.10; Orono News, $2.73; E. F. Nixon, $4.10; E. H. Bate, $1.85; Morton Co., receipt books, $38.98; J. A. Johnson, $3.10; bank collection, $1.30; sundry expenses, show week, secretary, $21.25		98.35

PRESIDENT'S ADDRESS.

By Harold Jones, Maitland.

It is a pleasure for me as presiding officer to welcome you to the forty-eighth annual convention of the Ontario Fruit Growers' Association.

Three years ago when the Horticultural Publishing Company purchased *The Canadian Horticulturist* from us, we found that our membership decreased to a large extent. The fact was that a great many became members of the Association for the sake of the journal only. Many of them were amateur horticulturists only, residents of cities and towns, and took very little or no interest in the annual reports and bulletins issued every year that are so valuable to every fruit grower. It brought us down to rock bottom, a solid foundation of a few hundred members that were all men who grew fruit—fruit growers in every sense of the word.

In spite of our seeming decrease in membership, our Association is coming into closer touch and sympathy with the fruit growers than ever before, through the co-operative fruit societies and local fruit growers' associations. These local associations are to a large extent in affiliation with our Association, receiving its benefits, and I believe the day is not very far distant when you will see every fruit grower in the Province a member.

I need hardly draw your attention to the magnificent Horticultural Exhibition this year. In the fruit department the entries are increasing, and the Province is being represented from every quarter. Our Association can feel proud of being the means of bringing together the fruits of the Province for the admiration and wonder of both Canadians and visitors from foreign countries. It is probably the greatest educative feature ever undertaken by our Association, and is bound to result in the growing of more and better fruit as well as attracting buyers from all quarters.

As an Association, we have steadily developed along the educative line, and our influence in guiding legislation is more and more recognized from year to year. We have a great future and a great responsibility before us.

I would direct your attention to the report of the Secretary for particulars of the work done during the year. I am sure we all recognize with grateful acknowledgements the generous aid given by the Department of Agriculture of the Province in carrying on the educative work, and particularly would I mention our able Secretary, Mr. P. W. Hodgetts, in conducting the horticultural exhibit at the Winnipeg Industrial last July, when he was able to demonstrate to the people of our great Northwest that our fruit could hold its own against all comers.

Mr. G. A. Putnam also gave valuable aid to the Association by arranging the 45 meetings held over the Province. Messrs. A. E. Sherrington, D. Johnson, and W. D. A. Ross proved enthusiastic and energetic workers in organizing societies and deserve much praise for the results obtained.

Our Association fully appreciates the valuable information furnished by the Fruit Division at Ottawa in the monthly reports on fruit and market conditions, and wishes to convey its sincere thanks to the Hon. Sydney Fisher for the able assistance furnished in organizing associations. I am sure that our Association recognizes the great good that has resulted from the Dominion Fruit Conference held at Ottawa in March, 1906. It has resulted in strengthening our position, and gained the confidence of the world's markets.

There are possibly yet some weak points in the Fruit Marks Act that might be remedied. At a meeting of the Glasgow Provision and Fruit

Trades Association, held in Glasgow last August, Mr. Barrow, President of the Fruit Trades Association, in the course of a few remarks complained of the high freights from Montreal, and in the case of barrels of apples found to be falsely packed, he thought they should be repacked before being allowed to go forward. I suggest that you consider the question of having another conference, and, if you think it advisable, to ask the Minister of Agriculture for the Dominion to call a meeting at an early date.

At the recent meeting of the American Pomological Society held at Jamestown, Virginia, Prof. Macoun found there was a strong desire on the part of many of the prominent members of the Society to hold their next meeting in Canada. The next meeting will be held in about two years. I am sure your Society will see the importance of having such a strong society as this holding a convention in Canada, where Canadian and American fruit growers could discuss together the many important matters common to both. I would ask you to consider the matter, and suggest that you send a formal invitation from your society to the President of the American Pomological Society, bearing in mind the importance of selecting a place of meeting where ample hotel accommodation could be secured.

It is through your association, with the hearty co-operation and assistance of the Department of Agriculture, that the several experimental fruit stations have been able to do so much good in the way of determining the value of different fruits to the several sections or zones of the country. The work in the past has been mainly along testing known varieties; with the advent of an experiment station such as is being organized at Jordan Harbor, the time has arrived when careful and scientific research should be undertaken to produce the ideal or perfect fruit.

Our country is new as countries go, and although we have made great progress during the last few years along horticultural lines, we must remember we have a great future before us, and must live up to our opportunities and obligations.

As retiring president for the year, I bid every fruit grower welcome to our annual meeting, and hope you will attend all its sessions, join in the discussions, and work with a will to make our Association the grandest on the continent.

The PRESIDENT: With regard to the visit of the American Pomological Association, the question as to where their next meeting should be held came up, as I said, while I was at Jamestown, and invited them to hold their next convention at St. Catharines in the month of September. There is ample accommodation, and it is in the centre of the finest fruit section of the Province. It will be necessary for the Association to extend them a formal invitation to meet here at their next gathering, two years from last September. I have much pleasure, therefore, in moving a resolution to that effect.

Mr. W. T. MACOUN, Ottawa: The holding of such a convention here would be of great good to Canada, as many fruit growers in the United States have little idea of the present status of Canadian horticulture. It is just possible that the Nova Scotia Association may also invite them. I do not know what the hotel accommodation of St. Catharines is, but the President of the Association informed me that they would go to no place where they could not all be given accommodation in one hotel. There would probably be one hundred members present. They have a wide representation from all over the country, and I suppose eighty per cent. are horticulturists and officers of the experiment stations of the United States.

Prof. Hutt: Hamilton would be a more central place, and has the hotel accommodation, but they have not such good horticultural organization. I have pleasure in seconding the resolution.

The Chairman put the resolution to the meeting, and declared the same carried.

Mr. W. Armstrong, Queenston: With regard to the Advisory Board for the Station at Jordan, I think that the Board should consist of specialists for each of the fruits.

The Chairman: Perhaps you would present that suggestion to the Minister whom we expect to have with us this evening. I think it is a very good point indeed.

COMMITTEES.

The following committees were then appointed by the chair:

Resolutions: R. B. Whyte, Ottawa; M. Pettit, Winona; E. Lick, Oshawa; Alex McNeill, Ottawa.

Nominations: E. Lick, M. Pettit, W. H. Dempsey, A. E. Sherrington, G. A. Robertson.

NEW FRUITS.

By W. T. Macoun, Horticulturist, Central Experimental Farm, Ottawa.

In the early part of the nineteenth century, eighty per cent. of the apples then advertised by the nurserymen were of purely European origin; now scarcely ten per cent. are of European origin. This means that, during the past one hundred years, Americans have found out that fruits originated in the United States are better suited to their conditions than those that are imported. The result is that the European varieties are gradually passing out. When settlement began in this Province, the nearest source of supply for fruit trees was the United States. For that reason nearly all our varieties are of American origin, such as Greening, King, Spy, Ben Davis and Baldwin. Are we to conclude from this that the United States is the only place that can produce good apples? I do not think so. Our experience is that apples originated in this country are just as good as those originated in the United States. In Eastern Ontario, the growers tried all the American kinds with failure as the result in most cases. The result has been that there has been developed there apples of Canadian origin, such as St. Lawrence, McIntosh Red, Fameuse, and Baxter, which we need not fear to compare with apples from any other part of the country. There is no reason why Western Ontario should not originate apples of just as high quality as those of Eastern Ontario; but apples of American origin have done so well that up to the present there has seemed no pressing demand for anything else.

You will see, therefore, that there is a great future for the development of Canadian fruits. Plant breeding is one of the most popular subjects for investigation on this continent at the present time. Three-quarters of the Experiment stations are now engaged in this work, and perhaps half are breedings fruits that will be suited in a greater or less degree to the different parts of the country. Hundreds of varieties of fruits will in this way

be brought into notice in a few years, and the confusion that results from growing so many varieties promises to be far greater in the future than in the past, and something must be done to prevent such a state of affairs being brought about. The question for this Association to take up is, how can we test in the interest of commercial fruit culture the best of these varieties, and yet save the country from that condition where hundreds of varieties will be grown by fruit growers, thus injuring the export trade of the country? I think that the Association can do a great deal towards the desired end by developing the co-operative movement in the direction of buying large numbers of trees of few varieties, so that in each section those interested can arrange to buy in large quantities of a few kinds. There will then always be sufficient fruit of one variety to make up car load lots.

During the past year very few samples of fruit have been sent to us at Ottawa.

I should like to continue the remarks I made last year as to the work we are trying to do in the breeding of new apples. We have now over two thousand seedlings growing at Ottawa of apples that have been produced there. Of these about 200 have fruited, and fully 25 per cent. of these are varieties which we cannot discard at once, as we believe they may be useful in different parts of the country. Canada is a very large country, so that we have a vast territory to consider. If we get that percentage in 200, how many varieties shall we have by the time the whole 2,000 trees have fruited? Our future plan of work will be to plant orchards of the best ones, so that we may cull them out, and bring to notice only the very best.

As an example, I should like to draw attention to 23 seedlings of the Swayzie Pomme Grise, a variety of very good quality which, I believe, originated in Canada. The following statement of their characteristics will convey an idea of how much they vary:

Of the 23 seedlings under discussion only two resemble the Swayzie very much, although a large proportion of them have distinct Swayzie characteristics, one of the strongest being the crisp, breaking character of the flesh and the sprightly aromatic flavor.

The Swayzie, as was stated averages below medium in size, being sometimes medium, but oftener small. Of the 23 seedlings described, 2 are small, 12 medium, 4 above medium, and 5 large. In shape, the Swayzie is oblate to roundish, 14 of the seedlings are oblate, 6 roundish, 1 conical and 2 oblong. The Swayzie is a russeted apple. Of the 23 seedlings 2 are more or less russeted, but only 2 are much russeted. The Swayzie is sub-acid, but sprightly; of the seedlings 3 are acid, 8 briskly sub-acid, 11 sub-acid, and 1 sweet. The quality of Swayzie is very good to best: 8 of the seedlings are good to very good, 11 above medium to good, and 7 of only medium quality. The season of Swayzie is mid-winter. Of the seedlings 2 are August apples, 8 September, 5 October, 4 early winter, and 4 winter: thus 15 are summer and fall apples, and 8 winter, but this proportion will probably change as more seedlings fruit, as our experience is that trees of winter apples usually fruit later than those of earlier season.

Our intention is to prepare a report on these and place on record their true merits, which is one of the chief objects of this committee.

I am fully in accord with the President's suggestion that something should be done to unite the efforts that are being made at Ottawa with those at the Jordan Station in regard to the originating of new varieties. We have originated an apple called "Ottawa," which we believe is the best of those originated at the Central Experimental Farm. We believed it to be the future winter apple for the Province of Quebec, but it killed to the

ground last winter, fortunately not before it had been propagated. I consider it promising even for Western Ontario. Mr. Ed. Morris said that it was the most promising he had seen for years. If we would send such apples to the Jordan Station, their merits could be tested for Western Ontario. I have also a large number of seedling grapes of the later kinds, which might prove very valuable in Western Ontario.

Prof. HUTT: I agree with Mr. Macoun that one of the chief objects of our work is to keep a record of these new varieties that come up from time to time and give an impartial verdict on them. We shall have, as he has said, an increasing number of new varieties to deal with, as so many are going into plant breeding, and there is a great necessity for some impartial tribunal that can pass upon them before they are put before the public.

In dealing with the new fruits that are submitted to me, I try to find out first whether they are really worthy of reproduction. If they are, we bring them before this meeting; and if they are considered promising, we get scions and test them, so that we may not lose sight of any promising variety that may be originated. Some parts of the Province are in need of a class of apples that is not yet available. In the northern part of the Province for example, they have summer and fall apples, but no winter variety like we have in the southern sections. The Wealthy becomes almost a winter apple in the north, but they want a longer keeping apple, and our Committee must be on the look-out for something of that kind.

REPORT ON NEW AND SEEDLING FRUITS.

By Prof. H. L. Hutt, Ont. Agricultural College, Guelph.

Comparatively few seedling fruits have been sent in this year for examination, but among the few is one which I believe to be the most promising seedling which has yet come before my notice.

No. 1. The first is a seedling from Swayzie received from Prof. Macoun, Ottawa, and by him named the "Ottawa." This apple does not in any way resemble the Swayzie, but instead very closely resembles Ben Davis in shape and general appearance. It is fine-grained, juicy, mild sub-acid, but I consider it of only fair quality. Prof. Macoun, however, considers it the most promising seedling they have yet raised, because of its good keeping quality. It may be valuable where a hardy winter apple is required, but would not, I judge, be of value where better varieties can be grown.

No. 2. A seedling sweet apple grown by Mr. William Moore, of Mansewood, Halton County. This is a bright red apple, medium in size and oblate in form, something of the size and appearance of Wagener. It is, however, of particularly fine quality. Mr. E. Morris, to whom I sent samples, declared "It was very much superior to Tolman, having a pleasing sweet flavor." It is a good keeper and of about the same season as Tolman. Mr. Moore reports that the tree is a vigorous grower, came into bearing early, and has been very productive.

There is not a great demand for sweet apples, but this apple is worthy of propagation because of its extra fine quality for home use.

No. 3. On the 2nd of April, of this year I received a box containing a dozen specimens of apples from Mr. Isaac Pike, Bethesda, Ont. They were

large, handsome specimens, in excellent condition, about the size and shape of Northern Spy, but of solid, bright red color; in fact, the handsomest specimens I have seen for a long time. Mr. Pike explained that he had some years ago planted thirty seedling trees for the purpose of grafting, but two of the trees had such handsome foliage that he decided not to graft them, and these two trees have borne the specimens sent in. Upon inquiry as to how the two seedlings came to be bearing the same fruit, he explained that when he received these trees they were on the same root, but as he was able to divide them he made two trees of the one, hence both trees were of the same variety. The trees came into bearing early and proved hardy and productive. He says the fruit will hang on unusually well in fall without being blown off, and for this reason he allows them to hang until they obtain their beautiful color. It is excellent quality and a good keeper, keeping in fine condition until May. Mr. E. Morris, to whom I sent specimens, says, "This apple is certainly worth propagating. Its large handsome appearance and good keeping qualities would certainly make it a valuable acquisition."

Mr. MACOUN: With regard to the "Pike" apple, we have had it at Ottawa, and I do not think it is a seedling at all, but some old named variety, although which one, I have been unable definitely to ascertain. I have had specimens of apples from the Eastern Townships called "Kinkead," which I believe are identical with it. Descriptions I made of the two apples in differ- years read almost identical.

SEEDLING APPLE FROM PIKE, ISAAC, BETHESDA, ONT.—AKIN.

Fruit: Size, large; form, oblate, conic; cavity, deep, open, russeted; stem, medium length, stout; basin, narrow, rather deep, smooth; caylx, open; colour, yellow almost entirely washed with crimson; dots, moderate numerous, yellow distinct; skin, moderate thick, tender; flesh, dull white or yellow, juicy, tender, crisp; core, medium; flavour, sprightly, sub-acid, pleasant, somewhat like Spy; quality, very good; season, evidently mid to late winter.

General Notes: A handsome apple and very promising. Resembles Kinkead much. Specimens received from Prof. H. L. Hutt, O.A.C., Guelph, Ont.

Described by W. T. M. Date, April 9, 1907.

Division of Horticulture,
Central Experimental Farm, Ottawa.

KINKEAD—AKIN.

Fruit: Size, above medium; form, oblate to roundish conic; cavity, open, deep, russeted near base; stem, medium slender; basin, deep, medium width, almost smooth; calyx, open; colour, yellow, almost entirely overspread with rich, attractive crimson; dots, few, yellow, distinct; skin, moderately tender; flesh, yellowish, crisp, tender; core, medium, open; flavour, subacid, sprightly, good; quality, very good; season, probably early to mid-winter or later.

General Notes: A fine dessert apple, handsome in appearance and very good in quality; tastes very much like Spy.

Specimens received from Asa. Johnstone, East Farnham, P.Q.

Described by W. T. M. Date, December 22, 1906.

Division of Horticulture,
Central Experimental Farm, Ottawa.

NOTE.—Since the date of the meeting the Pike Seedling has been identified by Col. Brakett, Pomologist, Department of Agriculture Washington, as the Akin. Following are independent descriptions of the apple under different names:

REPORT OF CO-OPERATIVE COMMITTEE.

By A. E. Sherrington, Walkerton.

Your Committee beg leave to report as follows:—

The committee held two meetings during the present year, the first on March 5th, and the second on June 11th. At the first meeting various methods of carrying on the work of co-operation were discussed. It was decided that we should again co-operate with the Ontario and Dominion Departments of Agriculture in holding a large number of fruit institute meetings, when the benefits of co-operation could be brought before the growers. Your Committee desires to express their appreciation for the help that the Dominion Department has rendered to us by sending their Inspectors to assist at the fruit meetings, and we trust that they may continue to give us their aid.

At the first meeting in March, the subject of bookkeeping for the associations was discussed, and a committee was appointed to work out a uniform system of bookkeeping for the associations. A great deal of information was obtained from the associations and otherwise on the subject, and at the June meeting it was definitely arranged to get out a set of counter check books on a uniform plan for as many of the associations as wished to avail themselves of them. Ten associations adopted these books, but owing to rush of work at the factory, there was some delay in getting them out.

The Committee also discussed getting out other books for the associations, but nothing definite was done. Your Committee trust that they may be able to work out some feasible scheme for another year.

A number of resolutions were passed relating to the industry generally. During March, April, and June some sixty fruit institute meetings were held. They were addressed by D. Johnson, Mr. Gifford, Mr. Cary, Mr. Baker, your servant, and a number of other fruit growers. In the majority of cases these meetings were will attended, and a great deal of interest was taken in co-operation and the industry generally. As a result, a large number of co-operative associations were formed. We have now something over forty in operation, and, so far as I am aware, they are all making a success of it. But your Committee finds that there is a great deal of work to be done yet to bring the co-operative movement to perfection. Co-operation has taken hold of the people of America. It is only a week or two ago since we were favored with a visit from a gentleman from Cornell, New York, to study the co-operative system of Ontario. He expressed himself as much surprised to see that such a young province as Ontario was so far advanced in methods of handling the products of the orchards over such old states as New York. He said it spoke volumes for the enterprise of the growers. Within the last few days I have had a letter from a gentlemen who wishes to have an opportunity of laying before the associations a plan for the consolidating of the associations; and with that end in view, a meeting will be held in the near future, perhaps during December, or early in January, to hear his suggestions.

Mr. Macoun: What are your views in reference to the co-operative buying of trees?

Mr. Sherrington: I am very much in favor of it. This was one of the points I brought out at our meetings this year. The Oshawa Association bought on the co-operative plan. I believe that is one of the ways by which we can get the right varieties into a district. It might be a good plan to establish a small nursery in each district under the control of the co-operative

association. There is a small nursery at Newcastle, and I advised the local growers to patronize it, and induce the nurserymen to grow only such varieties as are suitable for the district and to enlarge his nursery. The number of varieties is a menace to our industry.

No doubt most of you are aware that we have a central association as well. We did good work there, but are hampered for funds, and for lack of money we cannot extend the work as we should like. We must appeal again to the good will of this Association and to the growers to assist us financially; it is necessary.

Q.—Do associations as a rule adopt uniform bylaws and constitutions?

A.—Yes, we provide a set of bylaws and rules as a guide.

This year we had a very serious shortage of cars, and those associations that have not a storehouse, will, I am afraid, meet with loss, and thus do harm to the movement. We find that associations that have a storage building and packing-house are a much greater success than those that are merely mutual associations and do the packing in the orchard.

R. Thompson, St. Catharines: Could not something be done to supply better information as to prices?

E. Lick, Oshawa: This work is such a very broad work, and one of so much detail that it is a question where to start and where to end. Mr. Sherrington brought up the matter of co-operation between the associations themselves. It would be a very desirable thing, but I do not think we are ready for it yet. It may be as hard to get the asociations to co-operate as it was to get the farmers to co-operate. We had better go slowly rather than rapidly, and be sure we are going ahead.

As has been stated, there is this year a strong probability of injury from frost owing to the car shortage. Apples in our section are left lying around for ten days or two weeks or longer before they can be shipped. This seems to point to the necessity of co-operation of all shippers, whether they are dealers or not.

There are two or three things that are of prominent importance, first, that our co-operative associations should get in a little closer touch with one another; second, that we get a more accurate system of books which can be generally adopted: the third thing is to work for the extension of the number of associations.

REPORT OF THE TRANSPORTATION COMMITTEE.

By W. H. Bunting, St. Catharines.

The results of the work of the committee are of the greatest importance to the fruit growing industry. We may adopt the best methods of production, take all the pains we can to prepare our fruits in good condition for the market, but unless we can place them there cheaply and promptly, our efforts will be practically nullified.

Some four years ago when I, with some other gentlemen, had the honor to represent this Association before the Railway Commission, which had just been appointed, we laid before that body a statement of the ever-pressing grievances under which it was felt the industry labored. We accomplished several things at that time; first, we succeeded in drawing public attention to the importance of the fruit trade more fully than ever before. In addi-

tion to that, the delegation was able to present in a concrete form some of the more pressing necessities of the trade. These complaints were received by the Commission with a great deal of interest, and it was practically admitted by the railway companies of this country that the statements made were correct and that conditions should be remedied. Some effort was made to remedy these difficulties, and at the present time, some branches of the fruit trade are reaping the benefit of these improvements; but not all.

Some of the things laid before the Commission were so far-reaching in their nature that it required time, and will require, perhaps, a little more time, and more pressure and more enthusiasm, not only of the committee but of the rank and file of the fruit growers, to succeed in accomplishing what is desired.

The question of the equipment of our railways for the transportation of fruit was one of the points at issue. The companies practically admitted that their equipment was insufficient, but they claimed that the abnormally large traffic of this country during the past few years has been of such a nature that they have been entirely unable to keep up with requirements. A few years ago the traffic officers of our two railways admitted that the service had almost broken down so far as the rapid and efficient transportation of fruit was concerned.

In passing, I wish to say that I think you are to be congratulated on having shared in the effort made some years ago, in connection with other agricultural organizations in the Province and Dominion, in having the Railway Commission established. If we owe a debt of gratitude to one man more than another in connection with this matter, it is to our friend W. L. Smith, who in season and out of season was active in pushing in every way he possibly could for the appointment of this Commission. It is due him that these remarks should be made.

Your committee has not been altogether idle during the past year. While we have not accomplished very much, the question of express matters has, since the express companies were placed under the control of the Commission, engaged our attention to some extent. It has been felt that the interests of the trade, more particularly for tender fruits, were of such a nature that a vast improvement was necessary in connection with the express business of the Dominion. The committee has been endeavoring to assemble some data and make preparations for an interview with the Commission at an early date. We find it very difficult, however, to get from the grower definite data on which to work. I do not know whether it is because some feel that they may be discriminated against in their dealings with the transportation companies, but for some reason they hesitate to give particulars, as to grievances that they are quite ready to speak of in a general way. Your committee does not know everything, and cannot find out these things without your assistance, and on behalf of that committee I ask every person here, whenever you have a definite transportation grievance, to forward particulars to the president or secretary of the Association. If you desire it, your name will be held in confidence, but we would much rather you came out frankly and plainly over your own signature in such matters.

I believe that the companies are anxious to give better service, but there are certain limitations that tie them up to some extent; but if we could impress upon them the importance and necessity of this work more fully than in the past, I have no doubt we should get, through the Commission, a very great amelioration of present conditions.

The difficulty of obtaining cars has been mentioned. This has been felt over a large portion of the Province. I am glad to say that, as a result of an

interview last week before the Commission, the matter is being investigated, and I have no doubt that all possible pressure will be brought to bear on the railway companies by the Commission to have the condition remedied.

Last week, in addition to this, there were several other matters brought before the Commission under the direction of Mr. Graham, of Belleville, and E. D. Smith, of Winona, who made formal complaint. They requested a stopping privilege at divisional points for the purpose of inspecting grading, and sorting carloads of apples. This would enable shippers, and particularly co-operative associations, to assemble cars at a divisional point, sort them, and for a small additional charge, send them on to their destination. It has been asked to make this apply to our North-west business.

Request has also been presented for properly heated cars during the winter season, and a sufficient number of icing stations at different points for the summer traffic; also accommodation for receiving perishable products.

The Act is explicit that railways must transport commodities with due diligence. The question was asked of the Chairman, what would be a reasonable time in which to expect a car? He considered that a reasonable time would be six weeks.

We have also asked the Commission to fix the responsiblity for damage and loss because of failure of railway companies to provide proper accommodation and transportation facilities, and for loss caused by delay. We endeavored to impress on the Commission the absolute necessity for some definite, sure and speedy method of arriving at the damages, and securing same, where they were occasioned in that way. It seems to me that this is one of the crucial points in dealing with transportation grievances. If we can succeed in fixing the responsibility, we shall, I think, have solved the difficulty of service and equipment. As soon as the companies find that they are liable for damages, I believe they will realize that it is up to them to provide facilities and avoid as much of this delay and annoyance as they possibly can.

At the present time the Commission has the express business under consideration, and, as I said, your committee have been endeavoring to secure data in reference to the matter, and will be glad to have from any of the members anything they may have to offer bearing on the question.

THE ONTARIO HORTICULTURAL EXPERIMENT STATION—PROGRESS OF THE YEAR.

By H. S. Peart, Director, Jordon Harbor.

Most of you are aware of the circumstances under which this station was secured by the Government, Mr. M. F. Rittenhouse, of Chicago, having donated the property. It is situated on the township line between Louth and Clinton in Lincoln County, on the lake shore, 11 miles west of St. Catharines, and six miles east of Beamsville, and contains 90 acres extending south ¼ of a mile from the lake front, being about 1,200 feet wide. The soil varies greatly. At the southern end there is a block of light sand with heavy clay subsoil at a depth of eighteen inches to three feet. To the north of that there is a ravine running through the property, where there is heavy black soil, but not one that is at all retentive of moisture, being easily drained by a natural water course. Up this ravine on either side we have

some land that is rather broken—part sand, part gravel and part loam—three or four acres altogether. There is a belt running diagonally across the farm, consisting of 20 to 25 acres of rather heavy red clay. Beyond that we have clay loam and a considerable block of sandy soil. Clay subsoil underlies the whole at a depth varying from eighteen inches to the red clay that appears right at the surface.

When I went to the Station in June, the wood lot had been cleaned up ready for some work in forestry, and practically all the land that had been cleaned up last season was sown with oats and seeded with red clover. Near the Rittenhouse public school on the southeast corner of the farm nothing had been sown, and there I conducted some vegetable tests.

The first work undertaken was underdraining. Mr. W. H. Day of the Department of Physics of the Ontario Agricultural College, made a complete survey of the whole farm, drawing plans for the drainage system, and a complete system of drainage was undertaken. We have since laid about 10½ miles of tile drain, and practically the whole farm is underdrained.

Since we commenced this work, I understand from the people living in the vicinity, that there has been more tile draining done this year in the neighborhood than in all previous years put together, so much for the influence of example. The work of draining occupied about ten weeks. At the start we used a subsoil plow, but found it too weak for the work. we tried one or two ditching machines, but they failed to work where there was any stone present. We then took a Verity pavement plow, which, with some changes we adapted to the work, and found that with four horses we could loosen the earth as fast as forty men could throw it up. We asked for tenders for the work of putting in drains, but found that we could put the tile in the ground and cover it for three-quarters of the sum named in the lowest tender for ditching alone.

After concluding the drainage, we laid out one or two service roads and divided the farm into blocks according to soil. The farm is now in very good shape to lay out in whatever way may be deemed advisable another season.

At the north end of the farm on the lake, there is an apple orchard of about eight acres, consisting of what are generally looked upon as standard varieties of winter apples. These trees are 20 to 25 years old, and are in fairly thrifty condition, although the orchard has been in sod for some little time. In this orchard I commenced a test of cultural methods. One-third of the orchard was plowed last autumn, one-third spring plowed, and the balance is still in sod. Even this year, which was a very trying one, the trees in sod appeared sickly compared to the others.

The lake road along the front of the farm is crooked and in many places very narrow, owing to the continual breaking down of the lake bank. A reservation of 66 feet along the shore was made to improve this road, and $19.00 was expended on it, irrespective of culverts. In an effort to preserve the lake bank, we are constructing a number of concrete groynes which will be toppled over the bank and used as breakwaters. Between these it is believed that the sand will build up and thus form a beach. I am unable at the present time to furnish any data as to the vegetable tests near the school. I believe, however, that we have soil there on which we shall be able to conduct tests with all kinds of vegetables and all kinds of fruits. Vegetable growing is coming into prominence in the district, and we hope to be able to do valuable work in this direction, both for the people of that district and of Essex as well.

I should like also to refer to the work Mr. Rittenhouse has done during the past year. At the base of the town line is a little grove of which he intends to make a picnic ground for the use of visitors. When the work is completed it will add very much to the appearance of the neighborhood. The town line is to be macadamized for three or four miles; three-quarters of a mile has been done this year, and a handsome concrete bridge is now being completed over the stream that runs through our land and crosses the roadway at this point. The road and bridge work is being done under the direction of the Public Works Department.

Mr. SHERRINGTON: While Mr. Peart was speaking the thought came to me, of what value is this Station to be to the Province in general? No doubt it will be of great value to the southern district, but I cannot see what use it will be to the northern counties or the northern districts, where fruit of certain varieties can be grown with perfect success. Fruits that may be perfectly successful in that district may be a complete failure over the Province as a whole. How are we to go about it so as to make this Station useful to the whole community? I am glad to learn that it proposed to co-operate with the Experimental Farm at Ottawa, and to test at Jordan varieties grown at Ottawa and *vice versa*. That will be going from one extreme, I was going to say, to another extreme. I think the move is in the right direction; but aside from that, I think that some of the district experiment stations could be made good use of in this way. I understand, however, it is the intention to do away with the local stations. It is not likely that the Station at Jordan can do good work in connection with new varieties of hardier plums, cherries and apples.

With regard to new varieties, I am strongly of the opinion that it is inadvisable to send out any new varieties either from Ottawa, Jordan or elsewhere, unless they are superior to, or equally as good as the old standard varieties, or will cover a portion of the season for which no varieties at present exist. A good work can be done at the Station in the direction of producing new varieties by crossing. If we could get by this means an apple equal in quality and productiveness to the Spy which would come into bearing a little earlier and carry better to the western market, it would be a great benefit to all concerned. The varieties thus originated should be thoroughly tested at the local stations before they are sent out to the nurseries, as varieties that will succeed in one district may not in another where soil and climate are different. But do not multiply varieties unless you are certain that they are superior to our standard varieties. In Western Ontario it is almost impossible to load a car of apples without getting 15 to 25 varieties in a car; therefore, I speak strongly on this point.

Mr. MURRAY PETTIT, Winona: When the deputation went before the Government to urge upon them the importance of establishing a station of this kind, the principal argument was that the farms at Ottawa and at Guelph were unable, owing to climatic conditions, to experiment with the more tender varieties of fruits, as they should, to be of benefit to Southern Ontario, where the bulk of the tender fruits are grown. I agree with Mr. Sherrington that we do not want to multiply varieties; there are too many now. But if, by proper hybridizing, the management of this Station can produce one peach with the productiveness, hardiness, and size of the Elberta, and the flavor and color of the Crawford, and the earliness of the Triumph, the whole expenditure on the Station will be well repaid. The Northwest is our great coming market, especially for tender fruits. If we had a peach of that description that could be laid down earlier on that market, and in that way lengthen the peach shipping season to that

market, and also compete with California growers, it would be of immense value to the Province.

The same thing applies to plums. If we had a plum as productive and hardy and of as good quality as the Lombard, with the shipping qualities of the Monarch, and as early as some of the Japanese, it would drive a lot of valueless plums out of the market and be of great value to the Province.

The same thing applies to grapes. If we had as good a grape as Concord, suited to all soils and localities, and as early as Champion, and as good a shipper as Rogers, it would be of immense value; it would prolong our season in the Northwest very much, and at a season of the year when the weather is warm and there is a better demand for grapes.

In my opinion there are thousands of dollars thrown away annually by fruit growers in the use of fertilizers. They use fertilizers on their orchard. If the season is favorable and they get a good crop, it is the fertilizer that does it. Fertilizer tests might be conducted at the Station with great advantage.

There is room, too for favorable experiments in pruning. Take the different heights, for example, at which peach trees are headed. In my opinion the short-trunked peach tree is healthier and longer lived than the long trunked. If the management would head every other peach tree there low, and the others fully as high as ordinary orchards are headed, give them similar cultivation and watch the results for ten or fifteen years, it would be an object lesson of great value.

I believe that the life of a peach orchard could be extended five or more years by not allowing trees to overbear. If the fruit is thinned and the trees are kept healthy year after year, you will get more regular crops, more peaches in the aggregate, and much higher prices, because they are larger and better quality.

We all know that there is a good deal of experimental work to be done in spraying, and it is unneccessary for me to more than touch on that subject.

Another thing I would suggest is that a Board of Control be appointed to consult with the management—men who make a specialty of some of the different varieties of fruit—and advise as to what experiments should be carried on.

E. D. Smith, M.P., Winona: A station such as that now established at Jordan has been greatly needed by the fruit interests for a number of years. I have advocated it most strongly for this reason; whilst we, as a portion of the Dominion have been contributing to the maintenance of experiment work at Guelph, Ottawa, and elsewhere, we have not had any experiments of importance with tender fruits, for the reason that these farms are in sections where they do not grow them. I think that Mr. Sherrington does not bear that fact strongly enough in mind. You have an experimental farm at Guelph, which has been in operation for a number of years, and experiments covering a large portion of the Province have been conducted there. The work, I assume, will continue. The Experimental Farm at Ottawa, and farms in the other Provinces, are continually making experiments that are of great value to the Province at large, but not to us. We might have been saved hundreds of thousands of dollars in planting worthless varieties if we had had such a station many years ago. For many years I have recognized the shortcomings of the qualities and kinds of our fruits. I have not the slightest doubt that there are trees of varieties in existence now that will fill many gaps in the lists. We can

succeed in testing them and bringing them forward only through a station such as this.

Conditions in regard to the industry have greatly changed. A few years ago our market was practically confined to Ontario; now it extends to other Provinces as well. Varieties that might serve well enough for the home market fall far short of being value for distant shipment. The growth of our market is almost entirely in sections we cannot reach with varieties grown previously. Take peaches for example; the great peach of the past has been Early Crawford; it is a magnificent peach in many respects, and is all right for shipping to Toronto, Ottawa, and Montreal, but for the Northwest it is of no value whatever. We have not a tender peach that we know of, with the merits of the Elberta, which will ship, and we want varieties covering the whole season; so that we need five or six more varieties as good as Elberta. We have had no opportunity for experimenting on that line.

Now that we have an experiment station, I hope one of the main objects and efforts will be to test varieties now in existence, but not generally known; but also to try to originate varieties that will carry better than existing ones.

Imagine what a market there would be in the Northwest for peaches, if we could lay them down sound, as we could if we had varieties as good as Elberta. Imagine the market we should have for plums if we could lay them down sound. Our pears carry all right, but we have not got an all-round good pear. It seems to me that the Experiment Stations of America are very weak that they have not introduced one. We have kinds that do not blight, but they have other serious defects which debar them from being valuable for shipping; or they are either too small like Seckel, or blow off like Anjou. A cross between these two might give the size of Anjou and the freedom from blight of Seckel, and the good quality of both. We are going out of the pear industry because blight kills the best varieties we have. There is great room for this Station to introduce a new variety of pears.

The same thing with grapes. There is a market in the Northwest that is entirely ours. Even British Columbia cannot compete with us in grapes, whereas it will do in other fruits. Imagine what a quantity we could grow and sell if we had a good shipping grape which would reach that market in sound condition. We have not got it unless it is a variety that has some serious defect. If we had a Lindley that would bear every year as I have seen Lindley bear once in twenty years, it would be worth millions of dollars. Concord is an excellent grape; the only fault with it is that it cracks so badly with handling the baskets that by the time they reach Calgary and the grapes are sold, half are mildewed from the cracks that are in them.

Hundreds of thousands of dollars have been spent on the experimental growing of apples. We have been paying our share towards it; what we want now is investigation in regard to the tender fruits that are grown so successfully in Southern Ontario.

Dr. Wm. Saunders, Director, Central Experimental Farm, Ottawa: I did not expect to be called on in this connection, because I have had little experience in the growing of tender fruits. I have looked on this new Station, as has Mr. Smith, as a Station for the growing of tender fruits, looking to the future of our peaches, pears, and grapes. It is true, we grow a large number of grapes at Ottawa, but the climate is not very favorable, and I would not recommend anyone to go into it there as a commercial undertaking.

I think that the subject you have under discussion is one of the most interesting that could have been brought up, and I have been interested in hearing what the different speakers have to say.

I have had a little more experience in the climates of the Dominion than most, and I have learned to regard the combining of all these qualities of fruit into one as an extremely difficult thing. I rather begin to take pity on the young man who has taken charge of this work, if he is expected and asked to accomplish all these things. I have given a good share of my life to such experiments, and we have never yet succeeded in combining all these good features in one fruit, or in one variety of grain. If we could get a variety of grain equal to Red Fife that would ripen three weeks earlier, it would be worth scores of millions of dollars to this Dominion. We have been working on that for twenty years, but we have not reached it yet. We have secured wheats from every country where we could learn of an early variety. We have secured earliness, but not the quality of the Red Fife. We are working now to try to introduce more Red Fife blood so as to improve the quality. But this will retard the early ripening. With wheat you have a crop every year, but in fruit you must wait seven, eight, or ten years to see the results of your experiments. I would utter a word of caution: do not to expect too much from the man in charge of this work. I do not care how large the committee of experts may be, he will find as many differences of opinion among the committee as he has experts. If such a committee is appointed, I would suggest that it should not be too large; half a dozen will be better than twenty-five.

A great many people are of the opinion (which I do not share very strongly) that soil is a great factor in producing different results in fruits. I think that climate has more to do with it. Sometimes soil has more importance attached to it than is warranted. Climate is certainly the great difficulty that we have to overcome. If the climate is unfavorable, we cannot produce fruits as a commercial undertaking at any rate, and if you cannot do that, you cannot supply the great market in the Northwest to which Mr. Smith has referred, where they can consume any amount of fruit that may be sent them.

I shall be very glad if we can make our work at Ottawa useful in any way to the work carried on at Jordan. We hailed with pleasure and delight the fact that the Province was going to do something in this direction. I think the Dominion should have done it long ago, but I have no doubt it will add to the results to have two or three institutions under different management aiming at the end desired, that of practical fruit testing in every respect, so that we may be able to point out to our people, what varieties they should grow, what varieties may be successfully shipped, and which they can get the most money out of.

Mr. F. H. Pattison, Grimbsy: I think it was not only a matter of convenience, but also a matter of justice that this station should have been established in the district where it has been established. It seems a most singular anomaly that these tender fruits were experimented with at stations where they could not possibly grow them commercially. I have been informed that the tendency of this Association is in a measure to degenerate into a society of apple growers. The apple is the king of fruits of Ontario, but at the same time I should like to remind the members of the Association that there is more money invested in the *tender fruits of the

*Dominion Census returns for Ontario, 1901, show capital value of all tender fruits, including peach, pear, plum, cherry, grape and small fruits, to be only $16,145,200, as compared with $34,201,950 for apple trees.

Niagara district than in all the apple orchards put together, and it is a singular injustice that no station has been established there before.

Spraying with lime and sulphur will check or exterminate the San José scale, but it is a most unpleasant thing to apply. The experiment stations are hunting for something that will be easier to apply and as satisfactory, if not more so. This, for our district, is one of the most important things that could be taken up by the station, because that is the district where the scale is doing the most damage.

Along the line of new varieties, such as Mr. Smith has pointed out, experimental work is of the highest value to us. Hundreds of thousands have been wasted, and many varieties are being grown to-day that are absolutely worthless to the grower.

Mr. ARMSTRONG: I am in sympathy with keeping a limit on the number of varieties in commercial orchards. We already have varieties of peaches in our orchard which, if we knew how to trim them and bring them into bearing, would prove valuable in the direction Mr. Smith has suggested. The question is how to trim them to make them bear as well as Elberta; they will ship to Winnipeg all right, and I believe to the Old Country as well.

ADDRESS.

By Hon. NELSON MONTEITH, Minister of Agriculture, Toronto.

I regard it both as a pleasure and a privilege to be asked to preside at such an important gathering of those representing the fruit interests as I find here to-night. Last night I had occasion to visit the exhibition at Massey Hall, and was surprised and delighted at the excellence of the fruit there displayed. It is a great credit to you as growers, and is of great educational value to the people generally, demonstrating as it does the finest horticultural products of the Province. The only difficulty seems to be that the exhibition has not yet made its way into the hearts of the people sufficiently to induce them to visit it in such numbers as its excellence warrants them in doing. It is our duty, if possible, to popularize this exhibition in this the capital city of the Province.

The Department over which I preside fully recognizes the growing importance from year to year of the fruit industry of the Province, and we are prepared to recommend the spending of the funds of the Province in any direction where it is felt that such expenditure will bring good results. During the past year a number of publications have been issued by the Department dealing with the fruit industry. Some three or four bulletins have been placed in the hands of the fruit growers containing information which will help them make a success of the business. A notable addition to our literature this year has been the publication of "Fruits of Ontario," which is a valuable work of reference for those engaged in the business of fruit growing.

An enlarged field for horticultural experiment has been opened to us through the inauguration during the past year of the Experiment Station at Jordan Harbor in the Niagara District. This station will, we trust, accomplish much that could not be successfully undertaken at Guelph in the way of introducing better varieties than have yet been secured. In this work we desire the assistance and co-operation of the horticulturists of the

Province, and we shall call for the advice of some of your leading representatives in connection with the work we purpose conducting there.

As I have said, the industry of fruit growing is all the time increasing in importance. Of apples alone we have over seven millions trees at the present time. It is within the range of possibility that each of these trees could be made to bear from 1½ to 2½ barrels of apples. If this could be brought about, and the product could be advantageously marketed, it would mean a great addition to our material wealth. But this is only one of the branches of horticulture. You as practical horticulturists realize even better than I do how this industry might be extended all along the line; I merely wish to point to the possibilities of the business and its importance to the community.

The aim for which we should strive at the present time appears to be greater co-operation among us, not only in spraying but in picking, packing, and marketing. My Department, as you are aware, undertook this year for the first time to make a grant to any five or more persons who would co-operate in the spraying of their orchards with a power spraying outfit. The assistance offered has been taken advantage of in a gratifying manner. We are desirous of helping this movement along so far as we can from a departmental standpoint, as I believe that much good may be accomplished by greater co-operation among producers. I do not wish to trespass on the time of the meeting, and we will now proceed to carry out the program.

COMMERCIAL FRUIT GROWING IN WESTERN NEW YORK.

By Willard Hopkins, Youngstown, N.Y.

The subject of commercial fruit growing in Western New York will be confined principally to the Niagara Frontier and to our own personal experience. Living as I do on the banks of the Niagara River, where our principal orchards are located, and owning a fruit farm on the Canadian side of the river, I feel a personal interest in the prosperity of the fruit growing interests of Canada as well.

About thirty years since, I began planting commercial orchards, and have continued to plant and re-plant ever since until we have now upwards of 300 acres under cultivation, consisting of apples, pears, quinces, plums, prunes, peaches, and cherries, and, beginning with the latter, we have almost a continuous gathering of fruit until the last of the apples are harvested. We have trolley cars running through the orchard with New York Central connection, so that we can ship to any part of the country. In planting the eighty acres of apple orchard thirty years ago, I made the error of planting almost exclusively the late bearing varieties, Baldwin and Greening, consequently had to wait twenty years for a remunerative crop; while, if I had planted Duchess, Hubbardston, Wealthy, and other early bearing varieties, I should have gotten returns in less than half the time. The quince orchard of about 1,200 trees, planted thirty-five years since, has borne crops almost yearly since six years old, and the present year gave us over 400 barrels, selling for $1,500. It has been necessary to spray them at least three times through the season to prevent black spot on leaf and fruit. The soil is a dark surface and heavy clay subsoil. Have scarcely used any fertilizer on this orchard.

We have about 10,000 pear trees growing, principally Bartlett, Kieffer, and Duchess, of various ages, and often gather 3,000 barrels of fruit, which is taken readily by home and export trade. The Bartletts usually go into cold storage within twenty-four hours after gathering. Well do I remember before the advent of cold storage for Bartlett pears, when the ordinary life of the fruit was about a week after gathering, seeing selected Bartletts offered on the Buffalo markets for 75c per barrel. Now, with the present facilities for handling them, we get from three to five dollars per barrel.

We endeavor to give our pear orchard clean cultivation and spray them two or three times with Bordeaux mixture. We try to go through the orchards once in ten days and cut out the blight in seasons when it is bad. Our plums are principally Niagara, Lombard, Coe's Golden Drop, and prunes of the Fellenberg variety. We never fail in having a crop of some variety and frequently of all varieties. The plums are largely used by local canning factories and the prunes go to Pittsburg, New York, and Philadelphia. They also are given two or three sprays of Bordeaux. In our early experience with prunes, they would make quite a growth up to the last of July; then the fungus would ruin the leaves, which would drop, and then start a new set of leaves in September, and the trees would go into the winter in bad shape. Since spraying, they and the Lombard plums carry a rank foliage all through the season.

A portion of the land occupied by our peach orchard of twenty acres has been growing peaches for the past seventy years with scarcely any time elapsing between the removing of the old orchard and the planting of the new one. Nine years ago we removed an old orchard, principally Early Crawford, that was badly infested with the yellows and small peach. We cultivated the land one year, and the following spring planted it to Reeve's Favorite, Elberta, and Late Crawford, and it has borne abundantly for five consecutive years. The sales from this orchard of 20 acres the present year realized upwards of $9,000, exclusive of packages or commission. This orchard, now eight years planted, was examined by government inspectors who found less than twenty trees with yellows or small peach.

We endeavor to keep our peach trees headed back so that they can be picked from a six foot ladder. One cannot be too careful in selecting varieties for planting. Take the Longhurst or Hill's Chili for instance, which succeeds well on warm early land; on ordinary land it is absolutely worthless. The Late Crawford and some other varieties which succeed so well with us, on the lake shore are subject to fungous troubles and are often shy bearers. In planting peaches, as well as other fruits, study your locality and conditions well, and get the benefit of others successes and failures. Fruit growers have no secrets. We are always willing to give away any information we have no matter how expensive it has been to us to secure. Within three miles of this orchard on either side of the river there are a number of farms of 100 acres each, portions of which are well adapted to peach growing, where the sales from the entire farm would not amount to the returns from an individual acre of this orchard, and the owners are living principally upon scenery. About four years ago the San José scale appeared in our orchards, coming from an infestation in Niagara-on-the-Lake, four miles away. They thought it had been carried by birds, particularly crows, which made nests in our large apple orchards. At first we received very little practical assistance from our experimental stations either at home or in Canada. I often think of the crude way your inspectors and experimenters, Messrs. Fisher and Healey, were preparing the sulphur, lime

and salt wash on a cold day in the last of March in an old iron kettle, and testing the effects of it on a few trees in the garden, and we concluded that if we had to apply that preparation to our 300 acres of orchard, we would surrender. But we established an experiment station of our own, using whale oil soap, sulphur and lime, and crude oil emulsion, and have got to using P.A. crude oil on our large apple orchards, put on just as the buds open, with the finest nozzle. This treatment we recommend as a last resort when the trees have been badly neglected. Ordinarily, we find crude oil emulsion prepared by putting 30 or 40 gallons of water in spraying tank, then put in 12 or 15 lbs. of whale oil or other soap and boil until soap is all dissolved, then pump 50 gallons of oil into the tank keeping the steam turned into the tank all the time, then fill tank to 200 gallons, keeping agitation going all the time. We use this emulsion one year, and if not comparatively free from scale, follow it the second year with sulphur and lime. We removed the upper storey from our 30 year old apple orchard, and now find comparatively little difficulty in reaching the tops of the trees with the spray, standing on an elevated platform on the wagon. I now show you a sample of fruit taken from this orchard, which three years ago was so badly infested with scale that the trees were dying and the fruit was only fit for the cider mill or dryer. The fruit is comparatively clean, and we had the satisfaction of selling it for $3 and $3.50 per barrel this season. We use sulphur and lime on our peaches, pears, and most varieties of plums and prunes. In our various orchards we have three, eight or ten horse-power boilers, with elevated vats, for cooking the sulphur and lime and the emulsion, and use four power sprayers and two hand sprayers. With modern means of applying these remedies, is it not surprising that hundreds and thousands of acres of apple orchards in Western New York, and in Canada between Hamilton and the Niagara River, are being abandoned, and in many districts you have scarcely enough apples to supply home demand and the canning factories, let alone any for export. There has always been great fear among small fruit growers that soon there would be an over-production and no remunerative market, like in 1896 when fine apples sold from 50c to 75c per barrel, and other fruits in proportion. Now this San José scale should allay our fears on that score. While orchards that are infested with all other pests may survive and be reasonably productive with careless or no cultivation or spraying for years, these untreated, scaly orchards are fit for the brush pile in from two to five years. You might as well hope to grow potatoes without spraying to eradicate blight and potato bugs as to think of growing a high class fruit without the use of spraying in a scale infested district. Such person had better quit the business, or what is better still, never go into it.

This general distribution of the scale through Canada and the States has been brought about by planting unfumigated nursery stock. Prof. L. O. Howard, of our Department of Agriculture, tells us that, in spite of the wide dissemination of scaly fruit in this country and to some extent abroad, there is not a single authenticated instance of the scale having been established from such fruit. In one of our old Greening apple orchards, the scale had killed most of the ends of limbs. We cut it back to within three or four feet of the trunk two years ago, and we now have a vigorous top, low down, and hope for good results. The same is true of our peach trees where cut back on account of scale. They have grown fine tops and are bearing excellent fruit equal to young trees.

The great question is, does fruit growing pay? When I see young men in our fruit growing districts leaving the farms for work in the shops, on the railroads, and many of the professions, for the great wheat growing districts of the Northwest, or chasing the will-o'-the-wisp to gold and silver fields, like the Klondike and the Cobalt, and overlooking the golden opportunities right at home, I think something must be radically wrong. The old-fashioned happy-go-lucky manner of fruit raising does not afford sufficient remuneration to keep the boys on the farm, while I could cite you hundreds and thousands of instances where small farms of 100 acres in Western New York between Genesee and Niagara rivers, with only a portion of them in fruit, have earned for the owners a competency producing, in single years, five, ten and even fifteen thousand dollars.

I recall an instance of a young man buying six years ago a 100 acre farm for $7,500, with 30 acres of fruit. It was paid for in four years, and this year he received $7,000 for the fruit on the trees from his 20 acre apple orchard; while another orchard of equal age and size within one-half mile gave as many hundred dollars. The scale and codling moth took the one, and sulphur and lime and Bordeaux took the scale and codling moth in the other. Another instance where a young man a year ago bought a fruit farm of 140 acres for $25,000, having $5,000 capital, and his sales this year realized over $15,000 from this farm. I could cite you, too, instance after instance where neglected fruit farms were bought and paid for in a short time by up-to-date young men.

The fruit growers' life seems to me very much to be preferred to that of a clerkship, even in a Government office, or an ordinary profession. Where is there a more delightful spot for a home than in your Niagara Peninsula or in Western New York? Instead of having to send our products thousands of miles to market, paying often three or four hundred dollars per car, we are within twenty-four hours ride of forty million hungry people.

In conclusion, I would say I have no regrets that I selected fruit growing as a calling. After all its vicissitudes, when, four or five years ago if seemed as if the scale would ruin all our orchards, it seems like getting back what I thought was lost. Although the present season was unfavorable for many varieties of fruits, we were gratified to receive from the sales from our home farm upwards of $20,000, and from all our orchards upwards of $26,000. After deducting the amount paid for help, spraying, material, and machinery, we have a nice bank account to winter on.

The Globe Peach appears to have a very delicate skin and is a shy bearer. This year the fruit did not nearly mature, while alongside these trees other varieties bore so that we had to prop them up. This peach is really the only failure we have had.

As to the use of crude oil, it is a very dangerous treatment unless used with skill and care. I know of an instance of a man (you might call him an unprogressive farmer as he never attends our farmers' clubs or reads our bulletins), who heard somewhere that crude oil would clean out the scale. He bought a few barrels, but not knowing that a special nozzle was necessary, he used his old Bordeaux nozzle and gave the trees a good drenching. He was surprised to find soon after that his trees had lost all their foliage, and it took them some time to recover it. If it had been used in a practical way with the finest kind of nozzle, he would probably have had excellent results. That has been our experience.

In our apple orchard we leave a strip of grass six or eight feet wide between the trees so that we can drive over the land in the spring with our

heavy sprayers. We get very high color, noticeable particularly with our Baldwin apples; even the small fruit bears this high color.

Q.—What spraying machines do you use?

A.—Our experiment station uses everything that comes along, almost. The Gasport people make a very effective handpump for tall orchards. We use gas engines for power sprayers

Q.—Have you used any of the commercial spraying preparations?

A.—We have never taken any stock in Scalecide and other preparations, which are designed to make money out of us poor fruit growers.

Q.—Have you ever used the wheel-power sprayer?

A.—It is all right for small orchards of from 15 to 20 acres. It seems to me it is better if anyone wants to purchase a gasoline spraying outfit, for three or four neighbors to have a kind of a stock company. The only objection to that is that everyone may need to spray at the same time, but that can be arranged better than to undertake to work an inferior outfit.

Q.—Have you used the Niagara gas sprayer?

A.—No; but I have heard it well spoken of.

Q.—At what pressure do you run your power sprayer?

A.—We make it according to the height of the trees.

Q.—What horse power engine do you use?

A.—About 2½ or 3 horse power. We have a number of engines, using them for cutting feed, sawing wood, etc.

METHODS AND RESULTS OF THE WORK FOR SAN JOSE SCALE CONTROL IN PENNSYLVANIA.

By Prof. H. A. Surface, Harrisburg, Pa.

In the Keystone State we have for years recognized the necessity of active efforts on the part of the State authorities and also fruit growers to save their orchards from the generally distributed and deadly San José Scale. For four and a half years the speaker has been concentrating his efforts, in the official capacity of the State Zoologist of the Department of Agriculture, upon the general topic of destructive insects, with special reference to the San José Scale. Our State has undertaken and accomplished certain work, which is now making itself plainly manifest. We had before us an unbroken field. The question was how to work out in detail the answers to the problems of our fruit growers. We must first secure the co-operation of the Legislature to obtain proper legislation and financial assistance in the form of appropriations, for without money no such great work as the suppression of this pest could be accomplished, or even properly undertaken. For a little over six years we have had legislation and funds providing for nursery inspection only, and although this work was properly done, it alone did not meet the full requirements of our fruit growers. We found it necessary to face four distinct problems. These were as follows:—

1. The determination of San José Scale in existing orchards, and instructing the owners of its presence and how to recognize it.

2. Educating the public to the importance and methods of suppressing such pests as soon as possible, and thus providing for preventing its further spread within the orchards or from the premises of one to those of another.

3. Inspecting nursery stock to guard against the further dissemination

of this pest on young trees, and particularly the inspection and cleaning up of premises around nurseries, in order to insure clean nursery stock.

4. Provision against the importation of pests on infested nursery stock or otherwise from other States.

We can now say that the results are such as to prove that solutions practical, effective, economic and satisfactory have been reached for each of these points.

Our work in conveying knowledge of the San José Scale and other orchard pests to the tree growers of our State has been accomplished by a corps of active orchard inspectors and demonstrators and by the publication of a periodical non-technical bulletin, aiming to state in plan language the practical facts concerning insects and higher animals found within our Commonwealth. Four years ago we had no mailing list. This was built up gradually by applications for the monthly bulletins. The law then prohibited the publication of more than twenty-five thousand (25,000) copies of each issue of such bulletins, but within three years the requests for these publications became sufficiently numerous to justify our last Legislature in passing a law providing for the publication of fifty thousand (50,000) copies of each issue. Upon the day of preparing this manuscript my mailing clerk reported to me that within the past week we has received 2,500 applications for the bulletins, coming mostly from teachers and farmers of our Commonwealth. I have brought some of these bulletins for free dis ribution, and can say that I believe they have been very effective in helping to spread a knowledge of the importance of combating insect pests, and consequently creating sentiment in favor of this important work. Almost daily we receive letters from persons who report that they have saved their trees from destruction by the San José scale by the methods outlines in our publications or correspondence.

The second method of extending practical knowledge of this subject has been to send our inspectors directly to the orchards, and in fact to all premises in the Commonwealth to make inspections of the various trees and shrubs liable to be attacked by the San José scale and talk with the owners concerning these pests, and also give us official report of the findings at each place.

We follow this by an official announcement sent from our office to each person with infested premises, telling him what was found upon his trees or bushes, and enclosing to him a circular of information, giving methods of treatment.

He is also sent one of our bulletins devoted to the San José scale, on which topic two issues annually are prepared,—one in the fall of the year and the other in the early spring. These are in order to be ready to meet the demands for information in the fall and spring spraying seasons. In this way there have been tens of thousands of inspections made in this State. We are gradually covering each of the sixty-seven counties and informing the owners of each orchard what kinds of pests are present and how to treat them.

In addition to determination of kinds of pests we must disseminate practical knowledge of the means of controlling such insects. For this purpose we have inaugurated a system of public demonstrations. Beginning about this time of year our inspectors take up this work. Public meetings are arranged in orchards at intervals of four or five miles throughout the infested districts. Large posters are prepared and put up in public places, and announcements are made through the newspapers concerning the dates and localities of the proposed demonstrations. Our demonstrators are equipped

with apparatus for boiling the lime-sulphur wash, a spray pump and complete outfit for each, and such knowledge of the subject as to be able to address an audience and answer questions. On the appointed day, rain or shine, their apparatus is taken to the assigned place, arrangements having been made in accordance with the following:

Application for Public Demonstration.—The demonstrator boils and applies about thirty gallons of the lime-sulphur wash, delivering a public address during the time of boiling, and answers such questions as may be asked him, also distributing bulletins and taking names for our mailing list. He is careful to perform all the steps necessary for successful spraying, especially including the second or re-touching coat. When owners see how easily this is accomplished, notwithstanding the statements as to the difficulty of application made by agents and manufacturers of commercial insecticides, they commence to take heart and spray, and the successful results of a few persons in the neighborhood are enough to induce others to "go and do likewise."

We have seen the need of commercial sprayers or men who own spraying apparatus and do spraying by the tree or job. We encourage this, and send our assistants to give free instructions to such persons. In general, good reports have reached our office concerning this commercial work, and we believe there is a bright future before it. The public demonstrations have been conducted during spring and fall for two years, and instead of the applications for such demonstrations and interest in them decreasing, they have increased, as the public sees the beneficial returns to persons who have been doing spraying. More questions are asked of demonstrators, our correspondence has greatly increased, and while we thought it might be possible to drop the work soon, because the public would be sufficiently educated to no longer demand its continuation, we can now say that it is only in its infancy, and we shall never reach the end of horticultural advancement. While the Legislature two years ago appropriated thirty thousand dollars per year for two years for this work, the last session of the Legislature appropriated forty thousand dollars per year, and the sentiment is now such that no doubt such sum will be given for the continuation of this important work as our citizens may require.

The person who has been led to think, by newspaper accounts or otherwise, that Pennsylvania is a State given only to political jobbers and robbery, can see in this that the public funds are really being used for the benefit of the masses.

Experiments with new insecticides, apparatus and methods of application, and other features for insect control, must be performed by us in order to obtain the most reliable information to place before the public. The speaker purchased a small farm, near Harrisburg, and planted trees thereon, and is using the bearing trees, as well as the younger ones, for experimental and practical purposes, at his own expense. Also, we have been able to obtain permission of many persons in the vicinity of Harrisburg to perform such experiments as we found advisable in their orchards. This has given us a positive knowledge concerning the various topics which we need to discuss by correspondence, in bulletins, or public addresses. The results of there experiments are published in the monthly bulletins or in our annual reports.

After controlling or suppressing the San José scale in orchards, it is very important to prevent further importation of this pest upon nursery stock or otherwise. With this in view, our legislation has been revised to some extent, giving the Secretary of Agriculture authority to take such steps

as he may deem necessary to prevent the importation and also the spread of the San José scale and other insect pests in our Commonwealth. I believe such laws to be wise and just. Instead of enumerating details as to the methods of procedure, and thus holding him down to hard and fast lines, established by law, he is given authority to act as he may find best, according to the circumstances. Of course, his action is through the State Zoologist and the inspectors, but we find such sentiment for proper prosecution of this work that we have not yet been obliged to resort to the final "iron hand of the law." This law, however, provides that should a person fail to carry out our instructions as to dealing with the San José scale, we must perform the work on his premises, and the expense thereof becomes a lien upon the property, just as a regular tax.

We have found it especially important to inspect the premises of adjoining nurseries to be sure that the nursery stock itself is kept free from constant re-infestation. While a few owners uttered protests against being obliged to destroy, spray, or treat their trees, because they were a menace to the adjoining nursery stock, there were none who did not finally comply with our request to clean up the pests on their premises; and the nurserymen are now well satisfied with the knowledge that, while our methods in the nurseries have been rather stringent, we are looking to their own good, as well as to that of the fruit growers.

We inspect nurseries twice per year, during August or soon thereafter, and also in February or March. This is an account of the possibility of the spread of the scale after the August inspection, and also because in midsummer it is impossible to make an inspection as accurate as it can be made when the leaves are off. There are about one hundred and fifty nurseries in our State, and four special nursery inspectors are required to do this work during the season for such inspection. If no San José scale be found the nurseries are authorized to sell the stock with fumigation, but if scale be found, the trees bearing the same must be destroyed or set aside for treatment and re-inspection, and the owner must give affidavit that he will fumigate all tree of varieties liable to be infested by scale before shipping them. A fumigation house must be constructed and is tested by our inspectors. An official license or certificate is then granted to him. As a result of this, there is not nearly as much scale found in the nurseries as formerly, not nearly as many nurseries infested, and not much living San José scale sent out on nursery stock.

To prevent the importation of scale into our State a law was passed, practically at the request of our nurserymen and fruit growers, providing that all stock of varieties liable to be infested with San José scale must bear not only a certificate of inspection but also one of fumigation before being brought into the State of Pennsylvania. The transportation companies are held responsible for carrying packages of nursery stock not tagged in accordance with the requirements of the law. To prevent further possibility of the spread of the scale by unscrupulous tree dealers selling bad stock, as has been done in some of our counties, we now require that all tree dealers must be licensed by our Department, in order to transact business in this Commonwealth. In order to obtain this license they must give the names and addresses of firms from which they expect to obtain nursery stock. The sources of the proposed stock are then investigated, and if the nurseries be found certified and doing business in their own States, their stock is accepted in ours, upon their certificates, with additional requirement of their fumigation tags also attached.

Provisions are made for taking care of the man who neglects his orchard and lets it become a menace to his neighbor. Any person can notify the Department that San José scale is present or suspected in a certain orchard, and it is our duty to send an inspector to make an examination and return an official report. If the scale be found present, we notify the owner and give him a certain length of time in which to treat it in accordance with the methods we find best. For example, if the trees be practically worthless and badly infested, and it be better to destroy them than treat them, we require their destruction. We generally give opportunity to spray, and as far as is possible give the owner the choice of insecticides if used at the strength which we prescribe. At the expiration of the allotted time, the premises are again inspected, and if the infested trees or shrubs have not been treated in accordance with our directions, we must do this at the expense of the owner, as stated above, for property adjoining nursery stock. We have not yet had a case of absolute refusal to comply with our request.

The results of this activity are being made manifest by better fruits than ever before. More persons are planting young trees, and older orchards are giving better returns. To-day there is hope, where three or four years ago there was darkness and despair. Hundreds of orchards in our State were either killed outright by the San José scale or destroyed by the owners because thought ruined by this pest. To-day there are hundreds of growers, such as Mr. G. C. Gelwicks, of St. Thomas, and others I could name, who have written to me that they now have excellent crops of fruit from infested trees which they had intended to destroy, but saved them by the help the State has given. Growers are encouraged, and we ourselves are made to take up the heavy burden with lighter hearts and renewed activity, because we see good results and bright prospects ahead.

F. H. Pattison, Grimsby: Is the scale spread by the importation of infested fruit?

A.—The scale can be spread only in its young and free moving stage. It is not spread by ripe scale infested fruit.

Q.—Would you allow the moving of scale infested fruit?

A.—Yes; I would not expect it to be carried by such fruit. The scale will get on fruit and fix on fruit, and before that fruit is ripe, it will reproduce. You will find scale on fruit on the tree; they have not been produced on the fruit but have crawled on to it.

Q.—In Toronto, in August, I saw pears exposed for sale in every stage of ripeness that were infested with scale; should this not be prohibited?

A.—I would not recommend prohibiting the marketing of such fruit, unless by so doing you compelled the growers to clean up their trees. I have tried my best to infest trees by placing scale infested apples in an orchard without success and know that it cannot be done. I will stake my reputation that scale cannot be carried on ripe fruit. I consider that the laws of Belgium and Germany in regard to scale infested fruit are unjust.

Mr. Cutting, *Canadian Horticulturist*: I have twenty letters from leading entomologists in the United States written during the past week in response to my enquiries on this subject, and in only one instance does the writer entertain the possibility of disseminating scale by means of infested fruit. Forbes and Howard are among the number.

Prof. Surface: These are two of the world's leading entomologists. A third is your Prof. Fletcher, who is of the same opinion.

INFLUENCE OF STOCK AND SCION UPON VARIETIES.

By W. T. Macoun, Horticulturist, C.E.F., Ottawa.

The question of the influence of stock on scion has been discussed more or less for two thousand years. The Romans were interested in the subject, and since then from time to time many scientific and practical men have written about it, and at the present time it is probably more discussed than at any other period in history. It is a live subject, and, therefore, one concerning which there is still something that is not yet known.

A few days ago I received the following communication:—"At a country village just outside Birmingham, England, I saw some splendid bunches of red and white currants which has been budded on the standard of the English wild rose."

There is evidently a good deal yet to learn on the subject of stock and scion. Some things seem to be fairly clear; one is that stock and scion do not unite as an organized whole, but form a more or less mechanical union. That is to say, the tissues do not unite physiologically, but merely mechanically. This fact seems to have been clearly proven by experiment. Where there is not a good mechanical union between stock and scion, the top will sometimes completely break off from the stock and the tree is rendered valueless. We have tried top grafting the European plum on the American plum. The result has been that in a few years the top has died, the union not being a good one. The same way with the sand cherry and the American plum.

Certain stocks suit the scions of some varieties much better than others, and closer study should be given to this question in the future. It is well known that certain stocks are better for the peach than others. It is the same with the plum and many other fruits, but we still have a great deal to learn in that regard.

The Board of Control of the Fruit Experiment Stations has started an experiment to try and solve the question of root killing of peach trees, which has been the chief cause of failure of the peach industry in the Leamington district. It has been suggested that this might be overcome by grafting the peach on plum roots. If anyone will look up the horticultural records of the early part of the 19th century in England, they will find that in those days the same thing was recommended for England, where the soil was colder than that of France and parts of Europe. I am fairly confident that when we get such an orchard started in the Leamington district, we shall get some results that will be surprising. It was found by the old experimenters that the peach would not live as long on this stock, but it has lived long enough to give very profitable crops. Mr. A. M. Smith has been propagating for the Board a large number of peaches on plum stock.

Regarding the affinities of trees, it is surprising how often trees of unlike character will produce a good union. At Ottawa we have top grafted the June-berry (*Amelanchier*) on the Mountain Ash. The union is perfect, and is only to be distinguished by a difference in color in the wood. The pear grafted on the Mountain Ash has succeeded very well, and others in the same way.

Some of the most interesting experiments of recent years have been carried on in France, the results of which have lately been published. You know that for years people have said they noticed some influence of stock on scion, but it could not be shown that there was any influence on the character of the fruit. I think all will agree that the influence is so slight on the fruit as not to be observable. The French experimenters, however,

have been carrying on experiments with herbaceous plants, where the result is seen sooner than in fruit trees, and the results are said to have been very marked as showing the influence of stock on scion, and *vice versa*.

I mention these things to show the possibilities in the future in the study of this subject. In the past we have looked for an immediate effect on the fruit itself. Where we should look for it is in the seedlings. If we were to take the seed from the fruit of a top grafted tree, we should be likely to find the influence of the stock on the seedling.

A. W. PEART, Burlington: If you were to take the Northern Spy and top graft on the Red Astrachan and Tolman Sweet, from your present information, would you consider that the Spy would be a trifle earlier on the Astrachan than on the Sweet?

A.—I should not consider so. We had one-half of a Duchess tree top grafted to Spy at Ottawa, so as to give one-half Spy and one-half Duchess, and the Spy always failed to mature before the frost came. The Duchess ripened practically at the same time as when not grafted. The Spy would make very strong growth, and the Duchess only an inch or two.

What we do know is that the stock influences the scion in the way of fruitfulness. Apples grafted on Paradise stock will fruit much earlier than on ordinary stocks, the result of such a graft being that the flow of sap is slower, so that there is more nourishment for the top of the tree than is absolutely necessary for leaf growth, and the extra nourishment goes into the development of fruit buds. It is, I believe the superabundance of sap in the top that causes fruitfulness. If we bear that in mind it will make clear all the results we get from top-grafting. With top grafted trees there is no perfect union, and the result is an abundance of sap for the top and early fruitfulness in consequence.

A MEMBER: Does not the practice of budding from row to row in the nursery, instead of taking the buds from matured and bearing trees, tend to decrease fruitfulness.

A.—At Ottawa we have about 140 Wealthy apples which have fruited since 1899. Some of these were grafted from very productive trees, others from less productive trees, and others from trees that bore poor crops every year. We grafted in two ways; we had them growing on the ordinary stock, and also top-grafted so that there were two top grafts on one stock. We have not had these growing long enough yet to give definite results.

To give an example; a few years ago I got some scions from Mr. Harold Jones of a very highly colored Fameuse which he has in his orchard. We grafted these on some of our trees. They fruited this year and the fruit is just as highly colored as in Mr. Jones' orchard, whereas on most of the trees at the Farm, the Fameuse apples are of the ordinary striped variety.

Mr. SHERRINGTON: Is there any stock that will by top-grafting bring the Spy into bearing earlier?

Mr. MACOUN: That is an experiment which I think might be made one of the most valuable at the Jordan Station. Lay out an orchard with varieties having strong growing trunks, and top-graft the Spy on each of them. We found at Ottawa that the Duchess brought the Spy into bearing in five years, but the top broke off a few years after fruiting. If we could find a stock that would make a good union and bring the Spy into bearing earlier, it would be of great value. We cannot do that at Ottawa, as our climate is not suitable for the Northern Spy type.

Mr. METCALF: When two varieties of the same kind of fruit are planted together, what would be the effect of cross-pollenization? I have in

mind say Kieffer and Duchess pears: mixed planting is said to be somewhat beneficial to the Kieffer.

A.—There is no doubt that mixed planting will, as a rule, produce far better results. Several cases have come to our notice. There was some discussion on the Lindley grape not bearing large grapes regularly. We have about 200 varieties of grapes in our vineyard, and our Lindleys produce large crops every year, the bunches being more perfect, I think, than in the Niagara district. There are so many other kinds around them that they get the kind that suits them, and are well pollinated. I know of an orchard in the Annapolis Valley where there are few trees of Golden Russet scattered among the other varieties, and I think they bear better crops than I ever saw elsewhere.

I should warn you in regard to planting McIntosh. We have found this apple to be self-sterile, and if planted in blocks by itself, it is not likely to produce nearly such large crops as if planted with other kinds. Be sure to plant other kinds with them that blossom at the same time.

Q.—Do you consider that Spy grafted on Ben Davis would be satisfactory?

A.—I should not think that any tree that comes into bearing as early as the Ben Davis, and yields as heavily, would do for Spy. I think it requires a stock that attains a certain vigor before it starts to bear, to be able to maintain the Spy.

Q.—I have them succeeding well on Ben Davis; they are twenty years old.

A.—Then it looks as though they would succeed. I have tried early bearing varieties with strong growing tops, and in every case they have been failures.

Prof. H. A. Surface: Upon this subject I have but little to add, for two reasons, first, Prof. Macoun knows much more about it than I do, and, second, I am not a professional horticulturist, and this is a subject that requires the study and observation of years of one working on horticultural lines. I can only give the results of superficial observation and study, and the information gleaned from other persons who had more ample opportunities than I had.

This is a much controverted question. I am inclined to think that the relationship of plant to stock is not so great as has been indicated by some persons who have written on the subject. There have been no definite laws established so far as I know. There has been but little of a definite nature written on the subject. There have simply been isolated observations here and there, which we try to put together. The York Imperial is just now the leading commercial variety in the southern part of Pennsylvania. The variety top-grafted on the Spy does not give satisfactory results, but when the York Imperial is top grafted on any other stock, we get good results.

Some stocks have a particularly good root system—the Ben Davis for example—while the Winesap has a poor root system. We know that some trees transplanted from the nursery will lean over more than others from the wind. This may be because of the difference in the root systems, a tree with a good vigorous root system not being leaned to the same extent.

I heard of a case where a nurseryman had a few trees of a white seedling apple, and on one of them the fruit always developed rot. The tree seemed to have a particular individuality of its own. They top-worked it with Spitzenburg and top-worked other similar trees at the same time. They found that on this particular tree the fruit of the Spitzenburg continued to

rot and fall, whereas on the other trees it remained sound. The conclusion from this was that the root had a direct effect upon the fruit.

We know that the Spy bears earlier in its life on some stocks than on others; also that the union is less perfect on some stocks than on others. I am inclined to think that this union is a restriction to be compared to pruning or ringing, for we know that ringing done at a certain time of the year to restrict plant growth will have the effect of making a tree fruit earlier, just as abundant pruning will do. I was told to-day by an English orchardist how they cut the tap-root of the tree to check its growth, and that it results in an earlier fruiting period.

It might be worth considering whether the effect of the scion on the root is not greater than that of the root on the scion. We know that the really useful material is elaborated by the leaves of the plant and not by the root. The roots merely take up raw material. I should not be surprised to see greater influence of scion on stock than *vice versa* on this account.

The whole subject is one for prolonged observation and experimentation, and I should prefer to be excused from talking on a subject on which I do not feel positive.

HORTICULTURAL DEVELOPMENT IN ONTARIO.

By Prof. H. L. Hutt, Ontario Agricultural College, Guelph.

The wonderful progress that has been made in the various branches of horticulture in this Province during the past decade is something that very few fully realize. I wish to call attention to a few points in this connection, for it is by considering the progress in the past that we come to an understanding of our present position, and are able to form some idea of the outlook for the future.

Horticultural development in Ontario has been characterized of late years by specialization, organization, and co-operation. No doubt the rapid progress of late has been brought about largely by specialization and co-operation, and the results already attained certainly augur well for the future.

As an indication of the recent progress let me call your attention to the numerous and varied horticultural organizations we now have in Ontario, most of which have been organized within the past ten or twelve years.

In fruit growing, besides our Provincial Fruit Growers' Association, which was about the only horticultural organization heard of about ten or twelve years ago, we have a number of local organizations in the large fruit centres. Then we have another Provincial organization, the Co-operative Fruit Growers' of Ontario, and about forty local co-operative associations, actively engaged in the handling and marketing of the fruit crop, or in all about fifty organizations under the head of fruit growing.

Then we have the Ontario Vegetable Growers' Association, another Provincial organization, and about twenty-five local vegetable growers' associations organized within the past two or three years.

In floriculture we have what is called the Canadian Horticultural Association, an association made up largely of the commercial florists of Ontario, who also have local organizations in some of the largest centres of the trade, as they have here in Toronto.

These associations are all made up of those more or less commercially engaged in one or more of the branches of horticulture. Then there are the amateur horticulturists with their Provincial organization and sixty-six local Horticultural Societies in various parts of the Province. In all about one hundred and fifty purely horticultural organizations.

There is not another Province in the Dominion nor a State in the Union that can compare with Ontario for completeness of organization. Does not all of this indicate that our people are becoming alive to their own best interests, and are uniting so that by mutual co-operation they may make still more progress in the future? I firmly believe that because of such organization and co-operation the progress of the next ten years will be many times that of the past ten.

I regret that as yet we have not full or reliable statistics as to the status of these varied industries. Both the Provincial and Federal Governments are considering the problem of getting such statistics, and I trust that before long these figures will be available. The fruit statistics presented by Mr. A. W. Peart at the last Dominion Conference of Fruit Growers gave us a little idea of the value of the fruit industry of the Province. The capital value of the fruit industry is estimated at between fifty-five and fifty-six million dollars, and the annual value of the fruit trade is put at about $8,000,000. This is merely the fruit growing end of it, to say nothing of the many allied industries.

The canning industry affords a good illustration of the development and progress of some of the allied industries. Fifteen years ago there were only six canning factories in Ontario, now there are sixty-six, and the number is increasing every year. These factories employ about seven thousand hands, and pay out for produce about $800,000 a year. The establishment of so many canning factories within the last few years is a most hopeful sign of the progress of the times. They afford a ready means of disposing of a large part of the crop, whereby it can be conveniently distributed to all parts of the country and made use of at all seasons of the year.

Regarding the vegetable growing industry, we can get as yet no very reliable statistics; but I think I am safe in saying that one phase of the industry, that of forcing crops under glass, has doubled many times over during the last five years.

Commercial floriculture is another branch of horticulture that has made wonderful strides within the last few years. It has been estimated that this trade has increased four hundred per cent. during the past ten years, and now amounts to about $2,000,000 per year.

I need not say more along this line. I refer to it merely to show how horticultural work is specializing and developing. Fruit growers are specializing even in the culture of certain classes of fruits. Vegetable gardeners are specializing in field and forcing-house crops. Florists are specializing in the production of cut flowers and decorative plants, while the ever increasing number of enthusiastic amateurs, in both town and country, interested in all branches of horticulture are giving more attention to town and country gardens or civic and rural improvement. And for all both commercial and amateur, in each line of work the outlook never was brighter.

There are no doubt a few dark clouds in the sky. The San José scale has come in and appears to be going to stay. But this only means that the men who do not spray will have to go out of the business, and the wide-awake, aggressive and progressive growers who wage war on this and all

other such pests are going to grow more and better fruit. The failure of the railroads to provide adequate facilities for handling the fruit crop is a matter that was well shown up by a few of our leading fruit growers before the Railway Commission in this city last week. This will be remedied, no doubt, in time, and the sooner the better for all concerned. There will always be battles to fight, but such fighting keeps us keen and on the alert.

If you will permit a personal reference, I may say that when, fifteen years ago, I was appointed Horticulturist at the Ontario Agricultural College, I was the first in the Dominion to outline and teach a regular course in horticulture. And for years, until the School of Horticulture was opened in Nova Scotia, ours was the only institution in Canada giving instruction in horticulture.

At that time fruit growing, because of the commercial importance it had attained, naturally overshadowed the other branches of the subject, and vegetable gardening, floriculture and landscape gardening, were looked upon more as side issues, and were treated on our college curriculum more from the standpoint of the amateur. But such is not the case to-day. These one time minor features in the Horticulture of the Province have made such wonderful advancement during the past few years that none of them care to take second place even to fruit growing.

The development and specialization in Horticulture and the commercial interests concerned are opening up extensive spheres for our young men, and the demand on our educational facilities increases in proportion. The introduction of Agriculture and Horticulture in our high schools; the development of our Fruit Experiment Stations: the extension of our co-operative work in which there are already over six thousand experimenters engaged: the establishment of our new Horticultural Experiment Station in the Niagara District: with the improvement of the facilities in our own College which we are looking for, as well as the kindly co-operation of the Experimental Farm at Ottawa, and the new colleges in the other Provinces, all these should afford to the rising generation inspiration and equipment for the work in which they are to engage. The horticulturist of the next ten years, whether fruit grower, vegetable grower, or florist, is going to have an immense advantage over his predecessors of the past decade.

THE PLACE OF THE FALL APPLE IN FUTURE PLANTING.

By Alex. McNeill, Chief of Fruit Division.

I accepted the invitation to speak on this topic with very great pleasure from the fact that I have a few opinions with reference to the position of the fall apple. These opinions I am anxious either to propagate or else have them corrected before they do mischief. Therefore I submit them to you in the hope that they will be thoroughly criticised, and that we shall arrive at the truth in reference to this matter of apples at different seasons, and perhaps in reference to the different varieties.

It is necessary that we should take this question of the apple industry into serious consideration. There is a little tendency, I believe, always and everywhere, to regard the fruit industry as consisting largely of small fruits and tender fruits. I can readily understand how that idea gains prominence even among fruit growers themselves. I was for many years particularly

interested in grapes and peaches, and to me those fruits meant everything; the mere question of an apple more or less, a barrel more or less, an apple crop more or less, did not matter much. But a wider survey of the industry has shown me fairly conclusively that the apple growers of Canada are in the majority in number at least, and I believe they are far in the majority as regards the amount of money invested in the industry. So far as the export business is concerned, the apple is everything, and altogether, I am inclined to think that if we value it at its true worth, whether as a producer of wealth or reputation for the country, we must regard the apple growing industry as the chief fruit industry of Canada. It is important that we should look at this matter in a large way, and I would ask those who are engaged in other lines—peaches, plums, grapes— to regard with a tolerant eye this matter of apply growing, so that we may as the Fruit Growers' Association of Ontario present a plan of planting, producing and selling the apple crop which will render it of greater national importance than it is at the present time.

With this question is included the consideration of the fall apple, which we emphasize this afternoon because it is perhaps the keynote of the situation. What are we going to do with fall apples? There was a time when these had little value in many parts of the country, and even yet in many places they are regarded as a waste product. On the other hand, we know of a few people, and of a few co-operative associations that are now, and have been, making more money out of their fall apples than out of their winter apples, which are usually considered to be the backbone, if not the whole thing, in the apple business. Neither of these views is right: the fall apple is not altogether worthless; neither is it more valuable than the winter apple, as would appear to be the case from the experience of a few of the more fortunate co-operative associations.

I want to present a clear idea of the place the fall apple occupies in the apple industry; then we shall have some guide as to where and how it should be planted, and how we should manage the growing of it. I will, therefore, endeavor to give the points in favor of these varieties, as well as the objections that can be urged against them.

I will not particularize varieties as that would lead to an endless discussion; I will not attempt to settle what varieties are fall, early winter, or summer varieties, further than this; let us agree that all apples, no matter what we call them, that have to be marketed before Christmas will class as fall apples, without distinction as to variety. The Wealthy is an early summer apple in Essex county and an early winter apple in Carleton county.

We are all agreed as to the many good qualities of such apples as the Colvert, Gravenstein, St. Lawrence, and, in many seasons in Southern Ontario, the Greening, (practically a fall apple in the Erie counties), and half a dozen other varieties. This includes some of our most prolific apples, and apples of the highest quality. The Gravenstein and Greening cannot be excelled in their particular qualities, either for cooking or eating. The Colvert is a splendid apple, prolific, of good quality, and a good carrier. The St. Lawrence, while not on our list, is an excellent apple, and if property handled, yields very large returns indeed. We can produce these apples at a much less cost per barrel, than we can produce the Spy. The market for these apples in Great Britain is opening up very rapidly. I am willing to stake my reputation that we can grow these fall apples in competition with the English growers, assuming that they also are growing for the English market. We can produce them more cheaply, and put them on the market

more cheaply than they can. We have, then, this unlimited market at our command if we will take certain precautions. In addition, the Northwest market is opening up for these varieties. The greater portion of our Dominion is there; it is developing rapidly, and notwithstanding a few adverse circumstances, the trend of immigration will continue towards this favored land, and we are by no means ready to supply the demand for fall apples that will come from there. Provided the apples are grown right, put up right, and are transported to the West properly, there is an unlimited market.

These apples are desirable because they are prolific; because they can be produced cheaply, and because there is an unlimited market for them. On the other hand, let me say that, so far as the local market is concerned, we shall always have a vast surplus of other fruits, as these apples come in with the later summer and fall fruits. We must always look for competition from other fruits in the local market; and I expect to see the local market flooded once in a while with these other fruits within the next ten or twenty years. They do well now, and will do well on the average, but there will be good and bad years in reference to these crops without a doubt as a result of over planting when the fruit is high priced, and under planting when we have a surplus. So far as the local market is concerned, the fall apple will rise or fall with these other fruits. The earlier varieties of apples will also interfere. There will also be competition with winter apples that are shipped at the wrong season. We shall always have these because growers who have not proper storage houses will not be prevented from marketing their fruit just as soon as there is any encouragement whatever to do so. While the present system of buying and selling is in vogue, it is also possible and probable that itinerant buyers will continue to buy these apples without any thought of holding them. I suppose that four-fifths of the apples bought in Western Ontario are bought to be shipped direct from the orchard either to Great Britain or the Northwest. The buyers have no thought of holding winter varieties until they are fit for market; but they take the varieties I have mentioned, together with Ben Davis and Spy, and harvest them all at the same time. Ben Davis, Spy, and Stark are going forward in large quantities now to the English market. It is in the interest of the apple growing industry of this country to take such means as may be necessary to stop this putting of the Ben Davis apple on the market at the present season. It is all right in February, May, June, July, but to put it on the market now is an outrage. These winter varieties that are going on the market at the present time will always be there to interfere with the sale of the fall apples. The period of cheap apples—when we will have a surplus of poor, second rate or wrongly marketed apples—will be from October 1st to Christmas. It is sometimes the case that apples will sell better then than they will in the winter time. I believe that last year the fall apples sold in the British market for as good a price as they did in January and February, but I do not believe it will be the case this year, nor will it be a normal condition of affairs.

That being the case, how are we going to divide on the planting of apples? Are we going to stop planting fall apples, and trust to the market being filled at that time with the remainder of the early apples, or are we going to provide definitely for the fall apple trade? My advice is to take the latter course and plant the most desirable variety of fall apples, and continue to plant them under favorable conditions and continue to improve our fall apple trade.

Just here let me say that the matter of locality has a great deal to do with it. Where is it desirable to plant them? Where can we grow them best? I would not advise planting these apples in the apple belt extending from Belleville to Lake Huron north of Lake Ontario, and continuing through south of Wellington county to Brantford, going through to Lake Huron and extending along the coast of Lake Huron. This region is specially suited for the winter varieties of the Spy and Baldwin groups. It would be a mistake for any man in this district to plant fall apples as a commercial speculation. In this section plant winter varieties and produce fruit that can be grown to greater perfection here than in any other part, I believe, of the American continent. This region can produce winter apples from 25c to 50c per barrel cheaper than in any other part of the American continent.

On the other hand, I would not advise people living on the shores of Lake Erie to plant winter apples, but fall and early winter varieties. If I were in that section I would plant very early varieties, and along with these, for larger orchards, fall varieties such as those I have already mentioned.

I say it would be a mistake to plant winter varieties in this southern tier of counties. They are in no better position than are the people of New York State to grow these apples. If these people who are living in the belt I first described have an advantage of 25c to 50c a barrel—remember that is from fifty to one hundred per cent. on the cost of production—it is an enormous advantage, an advantage which if a manufacturer had, he would simply monopolize the whole market, and I believe that part of Ontario can practically monopolize the export apple trade of the continent in fall apples.

I want to say one word of warning, the early apples will not be profitable unless they are grown with far more care than is necessary for winter apples. You cannot grow them with the same indifference to scab and fungus, and to packing and methods of marketing, that you can winter varieties. You must have clean culture, and spraying must be more carefully attended to than with winter varieties. These apples must also be packed in boxes for the best profit, and they must be treated, not as an article of luxury perhaps, but as something of greater delicacy than the ordinary run of market apples. They will not stand shipping in barrels nor will the market stand it. If you are going to make the most of the fall varieties, you must grow them more carefully than winter varieties, and give much more care and attention to the details of packing.

Q.—I come from one of the Lake Erie counties (Norfolk) which you recommend for fall varieties. Suppose I were a young man, and intended planting a commercial orchard, what varieties would you recommend for me to begin with.

Mr. McNeill: I would not plant a winter variety, except perhaps the Ben Davis or the Stark, and I would recommend these only because, so far as my experience goes, neither of these apples would be too mature to keep well with ordinary care. You could keep these apples in ordinary storerooms such as any man could provide, and could be reasonably sure of having winter apples for sale in February or March, and no large percentage of loss. On the other hand, if you attempted to keep Spys, they would, in an open winter, show a loss of from 10 to 35 per cent. when you came to repack them. If you plant early apples and fall apples, you would get more for them, if you handle them as I have indicated, than you would for the winter varieties even if you had them to perfection.

Mr. Jas. E. Johnson, Simcoe: I am glad to know Mr. McNeill has acknowledged that we have agreed to disagree. As to the planting of fall varieties in Norfolk county, I should certainly object to it. Mr. McNeill has a fruit farm in Essex county, I understand. I consider that the climatic conditions in Essex county and also in the Niagara district are entirely different from Norfolk county. The season of blooming is much later with us. The fall apples such as Duchess and Wealthy ripen at a season of the year when it is still very warm. We have a far warmer climate than in the Georgian Bay district, and the season of picking these early varieties is not nearly as well timed in Norfolk county as it would be farther north. I think that these varieties grow far hardier in the north, and if I had land along the Georgian Bay and were planting fall apples at all, that is where I would plant them. What are the conditions in the United States? In Michigan, the fall apple section is around Traverse City; in Wisconsin no fall apples are grown with any success south of Reedsburg. In the northern part of Iowa, they raise large quantities of fall apples. We must also bear in mind that enormous quantities of fall apples are being set out in the States I have named, and the fruit produced there will come upon the market at about the same time that our own fruit does. Fall apples from those States are now being shipped to the Winnipeg market in the proportion of four or five cars to our one. Last year the growers in Michigan and Wisconsin got $1.25 a barrel picked, and it cost $1.20 per barrel, duty and freight to place them on the Winnipeg market. As I have said, the acreage being planted to these varieties is very great, and at the season of the year when they come in, it does not take a big percentage to fill the market as there is so much fruit to be had.

In Norfolk county, suppose we had nothing but these fall apples, and there was a large crop in the States named? I do not think we should realize much on our crop. There is also the possibility of warm weather at that season of the year, in which case, if the fruit is delayed for a few days, as it often is, it arrives in poor condition. That is not the case with winter fruit, which will stand far more punishment. Therefore, taking the acreage into consideration, I should feel very much opposed to the growers in Norfolk going into these varieties when they can grow Spy, Baldwin, Greening, and perhaps King—although I do not recommend that on account of its shyness in bearing. They may not keep as long as some others, but I can get 50c. a barrel more for well colored Spy apples in the months of January and February than early varieties will bring. It will pay me to grow them in preference. Those are the varieties I consider we should stick to in Norfolk—that is, those who set out five or six acres. I am putting out a large orchard, and have planted McIntosh, Baldwin and a few Fameuse. I consider there is no apple grown to-day that will make the money for the grower that the Baldwin will. We have in our locality an orchard consisting of four acres of Baldwin, one acre of Spy and one of King. This year the Baldwins yielded about 200 barrels to the acre. The Spy trees yielded 200 barrels this year and about 125 barrels last year; the Kings, 120 barrels last year and 112 this.

Q.—That would give a net profit of about $400 per acre?

A.—About $2,800 on the six acres.

I should like to know how they can grow these apples cheaper in the belt Mr. McNeill mapped out than we can. We have different orchards there of five or six acres that have yielded from $1,200 to $1,500 to the growers. The orchard to which I referred has had the best of care and is

a great object lesson. I draw the attention of every member of our Association to it, and I believe it will result in all our orchards receiving far more care than in the past. Up to six years ago, it was very uncommon to hear of spraying, and orchards were neither cultivated, pruned nor fertilized. Last year we had seventeen spraying outfits in our district; this year, there were in the neighborhood of fifty. This is about the way we are developing. Up to three years ago the farmers thought very little of their orchards; after the last work was done they would attend to their orchard; now the first thought is to the orchard; they are beginning to see the money there is in it.

Speaking of Ben Davis, I would not recommend the planting of that apple. It has been planted largely in Missouri, Illinois, Kansas, Arkansas, Colorada, Montana, and there are a good many in Ontario. It is a good keeper, but very few people hold it in their cellars for their own consumption.

This year is one of the best in fall apples that I ever saw because the crop is short all over. Our sales netted us this year in the neighborhood of $2.85. We should not have realized quite as much if we had not had a retail market to ship them to. Our winter fruit this year realized from $3 to $3.25 a barrel. That shows the increase even though there is a larger supply of winter fruit in proportion to what there was of fall fruit.

As for the Greening, I have a great regard for that apple. I consider it the best cooking apple of the day. Bakeries in the large cities buy them as long as they are to be obtained. I should favor very much the setting out of quite a number of Greenings. They should not be picked too early in the season but left until they are mature. If we set out a lot of Wealthy and Duchess and the markets are flooded, what are we to do with them?

Mr. McNeill: Ship them to the Old Country.

Mr. Johnson: What are we to do with the culls? The canning factory is busy with vegetables and other fruits, and cannot handle them. They do not make good stock for evaporating. Therefore we have to ship what are good, and either feed the rest or let them lie. In a few years when the orchards that have been so largely planted come into full bearing, Mr. McNeill will be very sorry that there were so many early varieties.

The Chairman: We should like to know how the two kinds compare in value, both by the acre and the tree.

Mr. W. H. Dempsey, Trenton: During the last twenty years, on the average, I have received more money per acre and per barrel for the fall apples than for the winter—Duchess, Wealthy, Gravenstein, Snow, Trenton, McIntosh—these coming in before December.

The Chairman: With your experience would you plant more fall than winter apples?

Mr. Dempsey: I do not know that I would; I would not plant an orchard of any size with apples for the fall season.

Q.—What fall apples would you plant?

A.—Those I have named, and in certain locations, I would put in Blenheim.

Q.—How would Ribston do?

A.—There are very few cases where I find it doing well.

Mr. Sherrington: I think it would be a serious mistake for those living in the favored districts for winter varieties to plant fall apples. I live in a district favorable for the production of Spy, Greening, and apples of that class, and I for one would not think of planting fall apples, when I could grow better and finer varieties that will pay me better. But there

is a place for the fall apple, and there is going to be in the future more than at present, but they require a better system and more careful packing than winter apples, and will likely be handled in boxes. We have, in my experience with our association, a strong market for fall varieties, and it is not necessary now for us to waste any summer or fall apple if it can be quickly transported. With these things, we are receiving just as profitable prices as for winter varieties; but in the southern sections where they cannot grow winter varieties with the same keeping qualities as we can, I would prefer the fall varieties.

J. L. Hilborn, Essex County: I think that in our district there would be money in growing early varieties, principally Duchess, which produces remarkably well and colors earlier perhaps than anywhere else in Ontario. These may be followed with apples of Gravenstein class, which do much better with us than in colder districts. Greening is practically worthless on the soil along the lake where I live, as it does not thrive. What Mr. McNeill stated regarding the winter varieties is exactly in accord with what I have observed: that Ben Davis and Stark do grow well there and seem to be a better quality—they mature and develop better—than farther north; and they are about the only apple that will keep well till spring. I do not think it would be profitable to undertake to grow standard winter varieties in that locality.

Mr. Macoun: It seems to me that in this discussion the point of view of the Northwest fruit grower has not been taken into account. Any of you who have paid careful attention to the work of Dr. Saunders will know that he now has about 200 varieties of cross-bred apples that are perfectly hardy in the West. I feel perfectly confident that when we get two additional crosses, there will be apples, two or three times the size, that will be hardy all over the country. If so, in 25 years from now, there will be many orchardists growing summer and fall apples in the West to supply the local demand. Dr. Saunders has laid a splendid foundation for Northwest horticulture.

Mr. McNeill: I heartily agree with what Mr. Macoun has said, and am glad to endorse his tribute to Dr. Saunders' work. I think that the work he is doing should be recognized by all fruit growers, if only from a scientific standpoint. They should see to it that this work is not only adequately recognized at the present time, but that ample provision is made for carrying it to completion when he is compelled to leave it.

Even supposing they do grow these apples in the Northwest, our apples will be marketed and consumed long before theirs are ready. In Essex, Red Astrachans ripen by the 20th July, and would be marketed by the time these western apples are nicely through blossoming, so that no one in the southern counties need be afraid.

I would not advise planting early apples in the north. They have been planted in the north because many of them are exceedingly hardy and are the only apples that will grow. They have been planted not because they are early but because they are hardy; they do not compete with us because there they become fall apples. The fact that they have been planted in the north makes it possible to ship Duchess apples to Great Britain from August 1st to September 1st and always in their prime. To have that length of season is a great market advantage.

I heartily agree with everything Mr. Johnson said in reference to the apples of the southern counties. I do not want to be misunderstood on one

point: If you have winter varieties do not cut them down. It is a distressing condition that people should be so unintelligent as to destroy property worth from two to three hundred dollars per acre simply because they are not willing to learn how to handle the product, as they have done in Norfolk county and elsewhere. Mr. Johnson has done a remarkable work in the interest of fruit growing. By organization, apples that were formerly worth only 50c. a barrel are now bringing from $1.50 to $2, and for this you have to thank Mr. Johnson, who has created wealth as truly as if he had taken it out of the soil; more truly, indeed, for he has taken these thousands of dollars out of the earth and the earth is no poorer for what he has done. (Applause).

Mr. Peart, Burlington: Mr. McNeill's address was based of course on general principles. I do not doubt for a moment his statement that early apples should be grown in the southern parts of the Province, but I would not think of limiting southern growers to those varieties. Where I live we plant not only summer and fall apples but winter apples. We plant Duchess, Ribston Pippin, and King; also the winter apples, Spy, Baldwin and Greening. When I am asked a question as to what varieties to put in an orchard, I usually answer it like this: There are no two localities that will grow the same sorts of apples with equal profit. There is great variation in farms and a greater variation in localities. If I were asked that question by a young man in my district, I should probably point to several of the leading varieties in that district, which I know from my experience have made money for their owners. So in other localities. My advice would be: go to a successful apple grower of experience in your locality and ask him what varieties he would plant; follow his advice and you will not go far astray.

Mr. Johnston: I look for Baldwin and Spy apples to sell for more money in the future even than they are selling for at the present time. Very few have been planted in Southern Ontario or in Western New York

Mr. Harold Jones: Speaking as a practical fruit grower, I think we should be a little cautious about too many early varieties. We must remember we are handling a perishable product. If we overproduce the more perishable part of an already perishable product we shall suffer in the end. Early varieties come into bearing at an earlier age than the winter varieties; therefore you are liable to have over-production of this class of fruit quicker than in winter apples. Early varieties have been planted quite largely in the last few years. In the St. Lawrence Valley there are no winter varieties being planted.

Mr. McNeill: I would not plant them there; but there are no winter varieties being planted in Southern Ontario.

Mr. Jones: We do not want it to go forth that this Association recommends the wholesale planting of early varieties through the Province.

Mr. McNeill: Certainly not. Commercial orchards of early apples should be planted in Southern Ontario only.

GREAT BRITAIN AS A MARKET FOR CANADIAN FRUIT.

By J. A. Ruddick, Dairy and Cold Storage Commissioner, Ottawa.

While we naturally look to Great Britain as the chief export market for all kinds of fruit grown in Canada, we must not forget that the home market is an important and growing one, especially in the North-West. While the future may see apples grown successfully in sheltered localities in the prairie provinces, there are, and probably always will be, limits to the growing of fruit in the west this side of the mountains. It seems to me that it is hardly worth while trying to open up a market in Great Britain for tender fruits, tomatoes, etc., when there is an extensive market for those fruits within our own borders. The shipment of tomatoes is a little difficult, because the cold storage of tomatoes is not very satisfactory. This is a matter about which I have recently been making enquiry, and I learn from large warehousemen in different parts of this continent that they have never been very successful in carrying tomatoes in cold storage for long periods, except in a semi-green condition. The tomato seems to keep best in cold storage when about half ripe judging by colour. The trouble is that they do not ripen properly when taken out of storage.

Q.—In what shape should they be shipped?

A.—The demand in Great Britain is for a small, solid, smooth tomato, rather smaller than what is asked for in the market here. They receive them as a general rule in packages containing from four to six quarts.

Q.—Are the packages similar to the Georgia package—four small baskets in a tier?

A.—I am not acquainted with that package. Tomatoes are grow under glass extensively in Belgium and Holland for the British market, but the supply does not equal the demand. The retail price last September was 4 cents a pound.

Great Britain will take all the first-class produce that we have to offer. There are frequent agitations in favour of opening new markets for many things of which Great Britain is ready to take all we can produce. Thus, I find dairymen looking for a new market for cheese, although so far Great Britain has been willing to take all the cheese we could produce and pay as good a price for it as can be obtained anywhere. It is the large quantity of cheese which goes to that market that helps it to retain its place there. I think it is a mistake for Canadian apple growers to look elsewhere for a market so long as Great Britain will take all that can be produced. The larger the quantity, the more important the item becomes, and the more attention there is paid to it. If there is only a small quantity of a product, it is swallowed up in the great mass of stuff coming from all parts of the world. I do not think we have fully exploited the British market even with our apples. While every dealer is willing to admit that the Canadian apple is the best apple on the market, much better prices might be obtained on the average if we gave more care and attention to packing and general appearance. I have seen home grown apples selling at four shillings a dozen in England. It is reported that apples shipped from Oregon last fall netted the growers $1.32 per box f.o.b. These apples are admittedly inferior in quality to Canadian, but are put up in better style.

There are considerable quantities of Tasmanian apples now coming to the British market, and we may meet with some competition in that direction, but they do not compete with ours in quality, nor do they come in at the same season. They are being received, however, with a fair amount of

favour by the dealers. In placing any article of produce on that market, the dealer is a very important man to consider; the man who retails the goods is an even more important man to consider than the consumer. You must please him, and give him something he can sell at a profit, or he will not sell your product, but buy something else and place it before his customers in preference. He is more interested in pushing a line of goods on the market than the consumer is in asking for it. To show that Canadian apples are in favour on that market, I wish to draw your attention to the difference in price between Canadian and American fruit. One of the leading firms reports on the sale of two consignments, one American and the other Canadian, sold on the same day in which Canadian Baldwins brought one shilling and sixpence, Greenings, two shillings and sixpence and Kings, four shillings and sixpence more than the same varieties of American apples. When I was in Liverpool last September, the Fruit Brokers' Association asked me to meet them. The meeting was a very interesting one, and I was glad to learn that they were more than pleased with the improvement that had taken place in the condition of Canadian apples arriving at that port since the introduction of the Fruit Marks Act. The confidence thus created is worth thousands in the case of Canadian fruit growers. The purchasers have greater confidence in Canadian apples than in American apples at the present time, and this accounts to some extent for the difference in price already mentioned. In the case of the American apples none of the packages bear less than three X's, some four or five, and I have seen as many as fifteen. The number of X's does not affect the sale of the apples at all, for they pay no attention whatever to the marks on the American packages, but they do pay some attention to the Canadian marks. They do not rely on them entirely, but the fact that the quality of the fruit is, on the whole, up to the markings, has increased the confidence of the buyers.

Q.—Is not the Canadian barrel larger?

Mr. RUDDICK: Some of the American barrels are as large as ours. Those of you who are familiar with the Englishman's character know that he objects most strongly to being imposed upon in any way. My experience with people over there is that on the whole they are ready to deal fairly, and they want to be dealt fairly by. I do not know of anything that will more quickly disgust and turn the English dealer and consumer against a product than anything in the nature of misrepresentation. That is where the importance of having our apples packed and marked according to grade comes in.

With regard to the inspection of apples, I have heard it argued that this should be done at the point of shipment and not at the port where the vessel is loaded. The onus of packing and marking correctly rests on the packer, not on the Inspector or on the Government, and it is certainly in the interest of the packer and the grower that every confidence should be established in the grading and marketing of apples. Judging from the arguments one hears in his connection, many appear to think that if they could only market their apples as No. 1, even if they were really No. 2, they would be that much ahead. In reality they lose rather than gain by such a practice, because the apples are sold on their merits if the marking is not correct, and it is the greatest possible folly for packers to follow the practice of overgrading their fruit. The best evidence you have that you cannot raise the market value by marking apples No. 1 that are in reality No. 2, is in the marketing of American apples. I am pleased to say that the practice of overfacing is practically a thing of the past.

Q.—Does not the system of grading discriminate against the home consumer?

A.—Does not the home consumer get the same protection?

Q.—The product for the home market does not need inspection nearly as much.

A.—That is quite true. The argument I am trying to make is that the responsibility does not rest on the inspector but on the man who packs and markets the fruit.

A word or two as to the commission business. I had an opportunity of meeting the Liverpool brokers as I have stated. A few lots of Canadian apples were in at that time and also some American. I am not going to discuss the merits of this system of marketing fruit; that is one on which there is room for a difference of opinion. My own idea is that if I had apples to sell I should not like to ship them to Liverpool on commission; I would rather sell in this country and get the money. One point is worth referring to: It has been argued in some quarters that it would be better to have the auctions or distributing centres at various points throughout England and Scotland. The principal distributing points now are Liverpool, Manchester, Glasgow, London and Bristol. While there may be something to be said on both sides, it seems to me that the point at which fruit should be sold is the point of discharge from the steamer. Supposing you have 20,000 barrels of apples to sell, I think it better that they should be offered for sale at the large centre and have 400 buyers bidding on them, rather than to offer 10,000 at one point and 10,000 at another and have only 200 buyers at each place, because the competition is keener with the large number of buyers. The smaller market is more quickly and easily glutted than the larger one.

While in Great Britain last summer, I had some opportunity of discussing other phases of the fruit trade. One firm in Glasgow, which imports canned apples and pulp for jam making, pointed out one thing that is worthy of notice in connection with canning apples. Their greatest complaint was that there was not sufficient care observed in sorting varieties when they are put into cans. They found different varieties in the same can, the result being that while some were insufficiently cooked, others were reduced to pulp. They also pointed out that there was a great market for raspberry pulp. I do not know enough about the business to say whether you can go into the exportation of pulp or not. This firm imported 250 tons of raspberry pulp from Tasmania last year. There is a tremendous market for that class of product.

The question of cider and cidermaking is of some interest. I spent some time in visiting different cidermaking districts. I was not there at cidermaking time, and did not see the industry in full operation, but I saw and tasted plenty of cider. The quality is not quite so fine as some of the Normandy cider, but it is fine enough to be sold in some quantity as low grade champagne. As I understand it, there is little real cider made in Canada. Most of our so-called cider is simply doctored apple juice, and it has given Canadian cider a bad name in some quarters. In certain districts of England, the industry has been carried on for hundreds of years, and is very well established. They grow apples specially for the manufacture of cider. The cider apple is quite a distinct kind, and some of the orchards I should think are two hundred years old. The trees are of enormous size and bear large crops of small bitter apples, which are not edible in the ordinary sense. They are supposed to make the best cider, but other kinds are used also. One maker in Norfolk told me that the finest cider he had ever produced was made from Canadian apples and that it took second prize at the Bath and West of England show. Canadian cider is also imported and used for blend-

ing purposes. I am not prepared to say that Canadian growers can make cider and ship to Great Britain with profit at the present time, but there is evidently a demand that cannot be supplied locally, and in consequence there is a great deal of adulteration going on.

As far as I could learn, Canadian cider would bring sixteen or seventeen cents per gallon laid down at Liverpool. The freight would be about four cents per gallon from Western Ontario. You can decide whether it would pay at that price. Some makers say a barrel of apples will produce nine or ten gallons of cider.

Mr. SHERRINGTON: Nine gallons to a bushel and a half.

Mr. RUDDICK: That would be pretty high. The yield is from fifty to seventy per cent. of the weight of the apple according to variety. I think this is a matter that the fruit growers might very well consider. There is evidently a market for well made cider, i.e., the fermented juice of the apple. I am not prepared to make any announcement as to what the Department of Agriculture would be ready to do in the matter, but I shall be glad to hear from the fruit grower as to whether they need help in this industry or if they think it is worth helping. There are a large number of cider mills throughout the country but there is little real cider made, because the fermentations which are necessary for the production of cider are not under proper control. For one thing, mill operators will have to keep their premises cleaner and more sanitary than at present, before they can secure and control the proper fermentations. Everything about an English cider mill is thoroughly clean, and the greatest possible care is taken to prevent a wrong fermentation taking place.

The Board of Agriculture has established near Bristol what they call the National Fruit and Cider Institute. They give a great deal of attention to the manufacture of cider from single varieties of apples, and they find a great difference in the different varieties, not only in reference to the quality of the cider, but in regard to the fermentations that take place. English cider makers claim that to make cider in large quantities would be to destroy one of its peculiar qualities. They find that the individual maker is able to produce certain qualities that add very much to the pleasure of drinking the cider, as the little difference that exist are always of interest to a man who is a cider drinker. Not many farmers in this country would be prepared to carry on the manufacture of cider on the same scale that it is carried on by the farmers in Great Britain. The cider would never be made in Canada from choice apples but from the poorer fruit. If a large proportion of this inferior fruit was excluded from our export fruit, it would at once raise the standard of the apples that are offered for sale. One cider maker in Great Britain told me that he was able to make as much out of his inferior fruit by turning it into cider as he could get on an average for all the fruit of his orchard.

I have fully introduced this subject without going into deails, for it is a very large subject. I wanted simply to bring the matter before you and to say that, if the fruit growers are desirous of taking up this industry in a systematic way, I think the Department of Agriculture at Ottawa will be ready to assist in its development.

Mr. SHERRINGTON: Do you think that the Tasmania apple is going to come in competition with our product?

Mr. RUDDICK: It does not come in at the same season of the year, but if they continue to increase their production, as I am given to understand they will, the competition may be felt to some extent.

Mr. Sherrington: A dealer told me that we need not fear competition from Tasmania, as the fruit is all consumed before we make our first shipments, and the quality is quite inferior to ours.

Mr. Ruddick: That is so, but if the production is increased, the season will be extended for Tasmanian apples, by holding them in storage. As these apples show excellent keeping qualities, it is quite possible that there may be some over-lapping of supplies. The possibility of competition from Northern Italy is also to be noted. I saw apples from there selling at a fairly good price although small and inferior. They are packed in a light basket that holds about half a bushel, and are beginning to be placed on the market in quite large quantities. There is about as progressive a class of farmers in Northern Italy as you will find anywhere, and if they go into the business extensively, it may mean more direct competition than that of Tasmania or New Zealand.

Mr. E. D. Smith: With regard to the Fruit Marks Act, I believe it has a value to the shippers here, and I have always felt proud that this Asociation was largely instrumental in securing the passing of that Act. It has been of very great value and will be of still more value when fully enforced. At present there is nothing to prevent a man evading the Act by shipping by New York or Boston. I know of cases where the worst sort of trash was shipped in that way and marked No. 1 and No. 2 This stuff injures our reputation on the English market. The main object of the Act is that fruit may be sold on the marking of the packers; that we may have a uniform article to put on the foreign markets. We have not yet reached that stage, but I trust that in a few years such a result will have been accomplished.

With regard to inspection at the port of embarkation, Montreal does not receive one-quarter of our apples. That is one of the main reasons why there ought to be some inspection at the point of shipment, if a man wanted it, so that he can sell his apples as having been government inspected. I hope that sometime the provisions of the Act will be extended to cover this.

Mr. Tweddle, Fruitland: I think the fact that fruit is shipped *via* New York and Boston from Southern Ontario points is one that should be taken notice of. We can often get cars to ship *via* Buffalo, whereas we cannot get cars to ship by Montreal. I do not suppose that these apples are inspected at all. I should like to see an inspector at Fort Erie for instance. If there are any buyers in our part of the country who want to get anything through that is not graded according to the Act, they now have every opportunity of doing so.

Mr. Sherrington: If our apples could be inspected at the point of shipment, we could close our deal at that point, and would not have to meet complaints that the fruit was not as represented. Sometimes the dealer is unscrupulous; sometimes deterioration takes place through delay by the transportation companies. This would overcome a difficulty we have with some dealers in distant markets. If the inspection staff could be increased so as to admit of local inspection at the apple shipping season, it would be a great help to co-operative associations. Perhaps it would be possible to have apples inspected on arrival at their destination in cases of dispute.

Mr. Wm. Rickard, Newcastle: This is a matter that can be regulated by the contract entered into. I think I know as a grower and shipper what kind of a contract I want. I sell my apples for so much f.o.b., and the contract is closed. There is no question of any inspection. If you want to inspect, do so before we load the car. I have sold car after car without inspection and never had any complaint afterwards. But if there is to be

any inspection, that is the time to make it; then close your contract, and get your money through the bank.

I think the growers will recognize that if every package of apples put up in this country is to be inspected before it is sold, it is a gigantic undertaking, and would cost an enormous sum of money.

Mr. Smith: My suggestion is that the inspection at point of shipment should be at the expense of the shipper. Apples sold by a commission merchant do not require to be inspected, because they are sold on their merits; neither would it be necessary to inspect apples for the Old Country at the shipping point, although many shippers would like to have it done. If I were buying a car lot from a stranger, I would be quite willing to pay the cost of inspection, and it would not be a very serious undertaking. The inspection of every barrel would not be required, sample barrels would be taken. I think that many shippers would be glad to pay a small charge if it were necessary.

With regard to export apples, I should like to see the inspection extended to Niagara Falls and other similar points through which shipments are made via United States ports.

Mr. Lick, Oshawa: Would it not be possible to have three or four inspectors placed in Ontario, who could move quickly to different points so that the Asociations would not know when the inspector is coming. Perhaps a little more of that kind of inspection would overcome some of the difficulties complained of.

NURSERY CONTROL FROM THE NURSERYMAN'S STANDPOINT.

By E. C. Morris, Brown's Nurseries.

I have been asked by your committee to prepare a paper on the subject—"Guaranteeing Nursery Stock." Last November this subject was discussed by the fruit growers, but the ones engaged in both fruit-growing and the nursery business did not discuss the subject, I am told. As for myself, I was not in attendance at the time. (Extracts following are taken from annual report, 1905.)

At this meeting, fruit growers express opinions as follows: Mr. G. A. Robertson illustrates: "When he (the fruit grower) ordered Elberta, he got white-flesh peaches." I should like to ask Mr. Robertson does he know of an actual case of this kind? Did the nurseryman intentionally deliver white-flesh peaches? I do not believe the nurseryman did so intentionally. No nurseryman in this day and age would dare to do it—not for fear of the law but for his own business success. Only a few years back, there was no fruit industry. Buyers of nursery stock and growers of nursery stock were careless: to-day all is changed. Mr. Robertson suggests "pedigreed stock." In theory or on a small scale this is practicable, but not in a large commercial nursery; processes are too slow and expensive as well as uncertain on account of fruit buds. All nurserymen, so far as can, buy Tennessee natural pits for their peach budding stock.

Mr. Peart says: "I have bought a good many thousand trees, and not more than 5% have been untrue to name. If the nurserymen will replace the varieties that are untrue to name or will top graft them or replace them in some way, I think it is all they can be expected to do." Nurserymen think Mr. Peart's views are nearly right. If you will drive through the fruit dis-

tricts of Canada you will not find 5% of all the millions of bearing trees turning out untrue to label, and suppose 5% or 10% did turn out so? Has the fruit grower lost money on his investment? No, he has not. If he had, the planting of fruit trees would cease: it has not, but is on the increase. This fact proves beyond question that the loss on this account is small and even in the face of it, the fruit growers' land is producing ten times in fruit what it did in farm crops. Thousands of acres of land would not to-day sell for over $70 an acre, were it not for the few hundred dollars of fruit trees planted thereon. These trees have raised the price of the $70 per acre land to $300 and $400 and even $500 per acre. On the whole, it does not look as though the "untrue to label" tree has worked a general hardship. It certainly would be delightful to have all trees planted grow and turn out "true to label." Twenty-five years ago last April I first started in the nursery business, and from that day to this I do not believe I have met six men who would acknowledge that they were at fault for trees dying or were mistaken as to the varieties ordered and got, until they were shown their original order. There are as many misclaims regarding varieties ordered and got as trees that turn out untrue. You may think that a wild statement, but it is a fact, which can be proven.

Mr. Rickard said: "I have been in touch with a great deal of planting of apple trees, and I think there is practically no loss from the trees not being true to name."

A Member said: "In my part of the country it makes comparatively little difference as regards apple trees, whether true to name or not, as they can be top-grafted."

Mr. Caston said: "Everything I have got in a commercial way from nurserymen has been true to label."

Mr. W. L. Smith referred to an orchard where "1-5 of the trees obtained from one of the largest nurseries of Canada proved wholly valueless." Mr. Smith does not say on what ground the 1-5 of the orchard were valueless. Was the then present owner of those trees the original purchaser of them, or did he buy the farm with orchard planted thereon, and take the former owner's word for the varieties it contained. Did Mr. Smith see the original order, or an exact duplicate, to know for himself before pronouncing his judgment? I ask these questions because experience has taught me that very often through the fallibility of memory, purchasers are mistaken, and forget and then make erroneous claims and statements. It takes very few trees eight or nine years to show whether it is the variety ordered or not, and the very first spring after a tree shows it is not right is the time to top-graft and not wait until eight or nine have passed. Then when he has top-grafted his tree, or budded it, the chances are 3 to 1 for even a stronger producer, had the tree been true at the start.

Nurserymen and seedsmen are in the same relations to this subject.

Your committee presented the following report—in part:

1. "It is a fact that much of the nursery stock planted in years past has been of inferior quality and untrue to name." I challenge that statement "that much of the nursery stock planted, etc.," That word "much" should be defined. Mr. Peart, an extensive fruit-grower, says, "not 5%"—that certainly is not much. A 95% yield of any crop is excessively large. A 95% sale of all manufactured products of any mill is very large. All loss that has fallen on the fruit-grower has been shoved off on the nurseryman, simply because the fruit grower will not act along the proper lines, to save himself from as much loss as possible, by top-grafting his trees. We hear a good deal said about five, six or eight years lost time, etc. It is a pity that

some growers do not think of that when they put the block and tackle to hundreds of bearing trees and pull them out, simply because the price of that class of fruit has gone down for a year or two, because, "they do not pay any more." He forgets that hundreds of others are doing the same, and the day will come when that fruit will go up. These eight or nine years lost are not counted in the fruit grower's profit and loss account. Oh! no. Because that's his mistake. But it's awful when 5% of his trees turn out untrue (and he could save the larger part of this loss if he would), and the other 95% are yielding him 1,000 to 1,500% profit on his investment, and have sent his $70 per acre land to $300 and in some cases $500. No, that does not amount to anything; we want the whole 100% perfect.

As for a Remedy.

From the foregoing, you will see, that in my estimation, as well as in the opinion of some of our best fruit growers, there is occasion for complaint about a very small per cent. of the total trees planted. It, however is so small a percentage of the whole that there certainly does not exist any alarming demand for immediate action or stringent legislation. Putting nurserymen under a bond accomplishes nothing. There is not a nursery of any size in Canada to-day that is not good for all its liabilities, and a bond does not make it one whit easier to collect damages, as you must sue the bond first and prove damages. Licensing agents accomplishes nothing. People to-day are wise enough to know what to believe and what not to believe, and if they are not informed it is very easy to inform themselves from the very clear and concise circulars issued by the experiment stations. Any man can get a license to sell trees, and without an examination as to his moral standing or veracity. This would not raise the standard at all. Common sense used by customers will protect them more than anything else. To pay 25c. for a tree, grow it three years, and then expect a nurseryman to pay $5, $10 or $25 damages where a tree turns out untrue, is not a fair proposition, as the earning power of that tree depends upon more than its name or the quantity of fruit it might produce. Prompt and proper planting are very essential to a healthy orchard. A higher price could be fixed at which stock could be guaranteed, but that price, if general, would cut off all planting. I would like no better paying venture than to buy trees at 25c., grow them three years and get $5 damages per tree; it would pay even then better than farming.

Some two years ago the United States Congress was surprised to find a Bill introduced to regulate traffic in trees and make nurserymen responsible for correct labelling. The introducer of that bill was more surprised than Congress by the reception he got. The bill was never mentioned a second time. There is no state law that I am aware of that is enforcible on this point. Some states have license and bond laws, but the fruit grower does not receive any direct benefit. It simply adds to the cost of trees, and the fruit grower must pay it in the end. Nurserymen are to-day far more careful than they were, and competition will clear up the trouble quicker than anything else, as those mistakes and mishaps hurt the nurserymen more than the grower, and so they should to make him careful.

With all the trees that turn out good, and with all the trees that turn out bad, the nurseryman suffers, too. He suffers no inconsiderable loss from tree purchasers being mislabelled,—marked "good pay" by local parties. But, that is the other side, and it only goes to show that we are all liable to mistakes. But please credit the nurseryman with a fair amount of honesty

and good intentions, and if any new legislation is deemed best, consider his interests, his problems, and his losses, as well as those of the fruit grower. Our interests are mutual.

Help the nurseryman by paying a fair price for his produce, and I know that he will do his part toward delivering to you trees true to label. It is to his interest to do it, without any further legislation.

NURSERY CONTROL AND LEGISLATION IN OTHER COUNTRIES—FROM THE FRUIT GROWER'S STANDPOINT.

By G. A. Robertson, St. Catharines.

I am very sorry that the writer of the foregoing paper is not present. I showed the writer the trees on my place, going over the orchard carefully and giving him full particulars as to the Elberta trees to which he refers. I do not wish to make this discussion personal, but I will say that some nurseries not two thousand miles from here, in appointing agents in the Niagara district, have a hard job getting men to sell stock in the locality in which they live and where they are known.

The growing of fruit in Ontario, dates back quite a few years, but it is only of somewhat recent date that it has been taken up as a special industry. Many of the older growers can recall the varied experiences in the growing and marketing of the tender fruits when first introduced, and the growth has been steady until to-day many of the growers are specializing along certain lines. The haphazard methods of planting seeds to make bearing trees, has given place to the better method of budding and grafting by taking buds and scions from some known variety, and using proper root stock to nourish these buds and scions which will in time become the bearing tree, and the steady demand for such stock is accountable for the existence of the large nurseries of to-day.

In the endeavor to get something better, to get something hardier, and to increase the length of the season for certain fruits, it has been necessary to introduce some new varieties grown in other countries, and as the business of fruit-growing becomes more centralized, we find every year some new insect and fungous pests, and many of these infestations are traced to the distribution of nursery stock, until to-day different countries have legislation for the inspection of nursery stock, and adopt fumigation as a preventive measure of further insect infestation. With the advent of these numerous pests, it is no longer a question: "Does spraying pay?" It has become an absolute necessity, and the work must be done thoroughly, and to-day in many districts may be seen fields with trunks of dead and dying trees, many grown up with weeds which mark the place where perhaps only a few years ago was an orchard which bore heavy crops of fruit, but is now dead because of the want of proper care.

This increased cost of caring for the orchard necessitates the removal of all weak and unprofitable trees if we are to make a financial success of the business. It has also directed attention to the removal of all unprofitable varieties and forcibly reminds us of what in former years we overlooked, namely, the varieties planted being untrue to name.

When I came in possession of my present premises, there was on it a thrifty young peach orchard of some thirteen hundred trees. At the close

of my first season the former owner offered me a chart of the orchard, which called for some three hundred trees at one end of the orchard of the variety known as Early Rivers, while there was not an Early Rivers tree in the orchard; and the varieties were so mixed that it was necessary to go over the whole orchard during the entire ripening season so that none should be missed.

My next experience was with cherries, and I placed an order for four hundred trees, fifty of each of the following varieties: Governor Wood, Knight's Early Black, Napoleon Bigarreau, Elkhorn, Windsor, Black Tartarian, large fruited Montmorency, and Early Richmond. The Governor Wood were about one-third true to name, the others are mixed varieties, many of them black, later ripening, and some are unprofitable. The Knight's Early Black are conspicuous by their absence, not one of the fifty trees are true to name; but have proved to be a later sweet black cherry, many of inferior size, a very shy bearer, and ripening along with the Black Tartarian. I got a large cherry grower to visit the orchard, and his advice to me was to cut them down, as he had some of the same and they would never pay. This is my reward for eleven years of care; manuring, spraying, cultivation, and pruning. The Napoleon Bigarreau Cherries were on first inspection mostly all true to name, but now the similarity is just in color; perhaps one-third are true to name, the others differing a little in color, shape and time of ripening. The Elkhorns proved to be fairly true to name, with a few exceptions, one of which probably came from the nurseryman allowing the root stock to grow up, as it bore natural fruit. The Windsors were true, with perhaps four or five exceptions. The Black Tartarian trees have the characteristic growth of that variety. The large fruited Montmorency are not true to name, but are Montmorency ordinary, Early Richmond, and other unknown varieties of the same type. The Early Richmond were mostly true to name.

My next experience was filling in my original peach-orchard, so I went direct to a self-styled "reliable" nurseryman, and in the place of Elberta and a few other choice yellow-fleshed varieties I had ordered, I got a number of trees which bear small sour white-fleshed peaches, and which ripen about the time of the first frosts.

My later plantings of pears, peaches, and plums were procured elsewhere, and I really think the nurseryman attempted to fill the order as ordered, as they are largely true to name.

My experience has been, I am sorry to say, similar to the experience of far too many; all suffer more or less. Only this year these small white-fleshed peaches have cropped out in a neighboring orchard under the assumed name of "Yellow St. John," and on Nov. 1st they were none too ripe, but suffering from the effects of a frost These were also procured from the same "reliable" nurseryman. Another intends to make sure he is to have his stock true to name, so supplied the nurseryman with the buds to bud the stock, and then found after the trees came into bearing that they were some poor worthless variety.

One not interested in the growing of fruit, especially tender fruit, such as peaches and cherries on a commercial scale, cannot appreciate the loss caused by the neglect to fill orders true to name, but wilfully substituting some other variety. Should I have a block of cherries I want a succession of varieties to keep my pickers steadily employed. I also want varieties least subject to rot, and trees which will bear profitable crops, and of good commercial varieties. The same is true with peaches. If I have a good connection with the retail trade, I want a succession of good varieties to start

with the earliest good peach, possibly the yellow St. John, and following up with other good standard varieties, and end with the Smock, not be rushed with several hundred trees ripe at once, then nothing to pick for a week or two; then another rush; and just because the nurseryman substituted.

Ontario fruit has borne a fairly good reputation, but it was thought to be in the best interests of fruit-growing for the Dominion Government to pass the "Fruit Marks Act." It was ridiculed by many, and sneered at as being unworkable and impracticable, but later revisions have made the law no less stringent, and now the wisdom of the enactment of such a law is becoming quite evident, as it has given confidence to buyers, and the dishonest packer gets his just reward. And yet what do we hear even as late as June 23rd and 24th at the Western New York Horticultural Society, of which some of us are members? The committee on Legislation reporting on a resolution in favor of a Federal law to define and fix the various grades of apples and to provide for their inspection when in closed packages reports:

"Such a law is unnecessary and not needed on account of public health and morals. Honest packers do not need an inspector. If a fixed grade were established packers could not pack up to it, on account of the lack of trained help; and the want of the necessary knowledge of growers and packers in general. It would give too much power to inspectors. To get the most out of fruit the grower should be allowed to grade them according to variety or season more or less. The proposed legislation suggests strongly the Canadian Fruit Marks Act, under which the growers and packers across the line do business, but which appears quite foreign to the free spirit of this country:" or as another speaker calls it "the freedom we enjoy under the American flag."

This Ontario Fruit Growers' Association meets annually with the object of furthering the interest of fruit growing in general. How better can we further our interests than by having a law enacted similar to the Fruit Marks Act, whereby it will be possible to get No. 1, No. 2 and No. 3 nursery stock, and have them true to name as the Fruit Marks Act calls for? While I believe some nurserymen are trying to do what is right, others will find it hard work even when compelled by law to do so.

The proposed enactment of such a law will be held up to ridicule as the Fruit Marks Act was. Ridicule! The mean contemptible way that corporations sometimes take to turn the mind of the public against proposed laws for the safeguarding of the interest of the public against the questionable methods of operation of such companies. Shall we insist on having such a law? If we do, we will get it. What has been the experience of each member of this Association?

The following are a few abbreviations of the laws governing the transportation of nursery stock in some of the States and parts of Canada:—

Alabama. Nursery stock has to be inspected. Scale insects and some other diseases are quarantined against.

Arkansas. Packages must bear certificate of inspection.

California. All nursery stock shipped into the State must have consignor and consignee's name; also name of the place where grown. All stock is subject to inspection and disinfection. Stock infested with pests not already in the State will be destroyed. No apricot, peach, or nectarine trees, cuttings, buds, or grafts will be admitted from any place where "yellows" or "peach Rosette" is known to exist.

Colorado. Incoming shipments are subject to inspection by county inspectors under the supervision of the State Board of Horticulture.

Connecticut. Stock must bear a certificate of inspection and fumigation.

Delaware. No stock allowed to be sold unless first inspected and fumigated with hydro-cyanic gas.

Georgia. Trees must have a certificate of inspection and fumigation.

Idaho. All nurserymen doing business in this State are required to furnish a surety bond for $1,000 conditioned on the faithful compliance with the law requirements as follows: (1) Representatives must have a certificate showing that their firm or firms have given bonds; (2) That stock being shipped into the State has been examined by a duly authorized officer and a certificate of inspection attached to each package; (3) All *trees, shrubs, plants, etc., must be true to name*; (4) any pit fruit coming from sections where peach yellows are known to exist is strictly prohibited.

Michigan. All nurserymen shipping into the State must fumigate and have also a tag or certificate of inspection and one of fumigation attached to each package. A license fee of $5 a year and a bond of $1,000 must be filed. The conditions under the bond are that only inspected and fumigated stock will be sold, and a list of customers will be furnished if requested.

New York. A certificate of fumigation must accompany each consignment of nursery stock shipped into the State, and all shipments are also inspected by New York inspectors.

Oregon. Inspects all stock regardless of all inspection certificates.

Washington. All nurserymen must secure a license before engaging in the business of selling and importing fruit trees. A license fee costs $5, and for each agent is furnished a copy of the license for $2.50 each, and is good for two years. The nurseryman also deposits a satisfactory bond for $1,000.

British Columbia. All stock must be inspected on arrival at the inspection stations. Nurserymen are required to put up a bond of $2,000 and take out licenses before being allowed to sell nursery stock. The bond is given on condition that the company will pay all damages that may be occasioned to any person in the Province through the sale to such person by the licensee, his agents or agent, of any infected fruit trees, plants or nursery stock, or any fruit trees, plants and nursery stock that are not of the variety and character as represented by the licensee, his agent or agents, at the time of sale.

Suggestions for the Enactment of a Law.

(1) No nurseryman shall be allowed by law to send or sell any known variety under a new name, or any other methods employed for deceiving the public.

(2) No firm shall be allowed to do business under more than one name.

(3) All stock shall be free from noxious insects and fungous and other diseases.

(4) That the law should be made more stringent with reference to the proper fumigation of nursery stock. The Government regulations as to the fumigation of nursery stock are stringent enough. Some fumigate in the house where the stock is wintered, and while the stock is banked up more or less to keep the roots moist.

(5) Stock shall be guaranteed true to name when sold as such. This stock should be tagged with the name of the variety, and also the locality of production be attached to such stock.

Mr. Morris: Do you know of any United States laws that bear directly on the points in question? Idaho is the most backward of the forty-five States, and is the only one that seems to have taken your view of the matter. It is a remarkable thing that the most advanced fruit growing States have not introduced such a law as you suggest.

Mr. Robertson: We do not intend to copy our Association after any in the United States. In the case of New York they tried to introduce a Fruit Marks Act. They left it to a Committee of the Legislature, which sneered at it as something that was done by those who grow and pack apples across the line.

Mr. Morris: I should like to learn if there are any other States except Idaho that have adopted such legislation as you suggest.

Mr. Robertson: I have not had access to the full laws of the different States. Idaho and British Columbia are the only countries that I am aware of. What would suit in the United States would not necessarily suit us.

Mr. Morris: Will you explain your reasons for that statement?

Mr. Robertson: My reasons are that we have been done up by certain nurseries, and we have very little redress. I should like to see a law passed giving redress. I have nothing to say to any nurserymen who tries to do what is right and gives us true, honest stock. But from what experience I have had, I judge that the prime object of many of them is to get rid of the stock they have in the nursery regardless of what their orders call for. I would ask that a committee be appointed to take up the matter.

Mr. Stevenson: The northern parts of this Province are overrun with fraudulent apple trees. I know there are honest nurserymen, but there are also dishonest ones. There should be some way of insuring that people get what they need and what they pay for. I do not think it matters what laws they have in the United States; we need to protect ourselves.

Mr. W. L. Smith: With reference to the statement in connection with which my name is mentioned, I had the facts before me at the time I made the statement. The party I referred to was a schoolmate. He has occupied the farm on which he lives for the past twenty-five years. He ordered the trees himself, and they were planted under his direction. If I said that one-fifth did not come out according to what was ordered, I spoke the truth. These trees were of an absolutely worthless variety, and the nurseryman acknowledged the fact in a letter over his own signature—that the trees were not true to name, and that something like one thousand of the same variety had been scattered broadcast over the Province. He offered, if I remember correctly, to replace the trees. But the man had planted these trees when he was past fifty years of age, and it took ten years to determine what he had got. He did not propose to replant for his old age after he was sixty.

Anyone who has been over in the United States knows that in matters of agricultural legislation this country leads, as we do in agricultural production.

Mr. E. D. Smith: I can assure you that there are two sides to this question, and at the proper occasion I should like to have an opportunity to present the other side.

Mr. W. H. Bunting: A comparison has been made between the Fruit Marks Act and some law in reference to nursery control. The comparison is hardly opportune. When criticism arose some years ago regarding the methods pursued in packing apples, the fruit growers rose to the occasion and asked Parliament to provide the necessary regulation. I feel sure that any nurseryman who intends to do what is right by his customers will hail with joy some reasonable and moderate restrictions that would safeguard

the matters that have been complained of. I am sure that these gentlemen would not object to anything that is reasonable to assist in helping to allay the feeling that has arisen and in safeguarding the business.

Mr. G. C. Caston: Agents do a good deal of harm, especially in the north, by recommending varieties altogether unsuited to the district. In many cases local agents do not know much about varieties or what is suitable. Great loss is occasioned in this way. I think it would be a good idea if the nursery agents would visit the nearest fruit experiment station and secure a list of the varieties they could recommend as being suitable to plant in that locality. Nurserymen should instruct their agents to do this. With regard to top-grafting, if you get good sound trees that are suitable for top-grafting on, you will not be very much out even if the stock supplied is not true to name.

At the suggestion of the Chairman, Mr. Robertson moved that a Committee to consider the question consist of Messrs R. Thompson, W. H. Bunting, P. W. Hodgetts and the mover.

Mr. Stevenson seconded the resolution.

Mr. W. E. Wellington: Before putting the motion, let me make a suggestion. A committee of fruit growers is all right; I do not think that nurserymen will object; but I do think that the fruit grower, as a rule, is a more intelligent man than the average man, and that in your own interest, if you would name a committee to meet a committee of the nurserymen, you could probably get together and bring about what you want without any friction whatever. Speaking as a nurseryman, I have no objection to anything that is fair. I would be prepared to put up a guarantee if it were necessary. While I think that the planter has ample protection as a rule, there are points that would be of mutual benefit if they could be brought out. It is of no use throwing this matter altogether on the nurserymen, nor on the tree agents, because, after thirty years' experience, I know that the fault is in nine cases out of ten with the purchaser. Time and again have I written to agents instructing them not to sell a certain variety. The answer comes back, "The man says if he does not get that variety, he will throw up the whole order." There are just as many rascally customers in proportion as there are rascally tree agents.

When you come to talk of experiment stations, we are in a position to give as much information to an agent as would the experiment station; but in addition to that, we do send them to the experimental stations. Only yesterday I told the agent at Ottawa to go to the Experimental Farm and get information as to the better varieties that have been tested there. There is no object in selling varieties discriminately, and we try, and I believe other nurserymen do—those nurserymen who grow their own stock and want to keep up their reputation—to fill correctly our customers' orders. Men may be perfectly honest and yet send out something untrue to name, because a careless employee has got hold of the wrong bud-stick. Nurserymen, I know, are willing to rectify such mistakes if they are approached in a decent way. I think that if you will name your committee, and meet a committee of the nurserymen, it will bring about what you wish with no friction whatever. We shall be glad to name a committee to work with you.

The Chairman: I hope you will see your way clear to meet the nurserymen in a fair open-handed way and see if something definite cannot be put before the Association at another session.

The motion to appoint the committee nominated by Mr. Robertson was then put to the meeting and declared carried.

Mr. Pettit: A committee representing the fruit growers having been appointed I think it only fair that we should appoint a committee of nurserymen to meet with them. I move that the following constitute the committee, Messrs. E. D. Smith, W. E. Wellington, and E. C. Morris.

Mr. Peart: I have pleasure in seconding the resolution, as I think it is a very proper one. I think that the majority of the nurserymen try to do an honest business, and that it would be perfectly fair to appoint a committee of nurseymen to confer with the other committee upon this question. I have had very little to complain of in my experience of the stock sent out by nurserymen.

The Chairman thereupon put the resolution to the meeting, and declared it carried.

ERRORS IN SPRAYING.

Prof. H. A. Surface, Harrisburg, Pa.

I have not prepared a paper for this occasion, and shall have to speak extemporaneously upon the subject:

A number of erroneous impressions are common in regard to spraying. There is a general impression that spraying is a preventive of all loss in fruit growing. Nothing can be more fallacious; it is not. I will try to bring out more clearly what I mean. First, there is a general feeling that it is necessary to spray to prevent the appearance of insects. I know of only one insect for which we spray to prevent its coming; that is the codling moth. We do not spray to prevent the coming of insects, although we do spray when they are present to destroy them and prevent loss by their attacks. If I had an orchard free from insects, I should not spray with anything, so far as insects are concerned, excepting that I would spray at the proper time and with the proper material for the codling moth.

There is a very general impression that Bordeaux mixture is an insecticide; it is not. At the same time, it may act as a repellant and drive away certain insects. It is simply a fungicide composed of copper sulphate and lime and if we wish to make an insecticide of it, you must add an arsenical poison.

There is also an impression that Bordeaux mixture will cure plant diseases. There is a difference between curing and preventing. Prevention is better than remedy. It will not cure fungous diseases, but will help to prevent their appearance. There is a great difference between spraying with insecticides and with fungicides. The difference is this: With insecticides, in all cases save that of the codling moth, we spray as a remedy; with fungicides, we spray to prevent the appearance of disease, such as scab, leaf spot, rot, mildew, peach leaf curl, etc. After such a disease as leaf spot or fungus has started in a leaf it cannot be cured in that leaf.

Again, there is an impression in our State that benefits can come from spraying trees in bloom. We do not spray blossoms and no benefit of any kind is to be had from doing so. It is bad horticultural practice. If there be a surplus of blossoms and you wish to reduce them, it will help to thin the crop, but it is a poor way of thinning, and not to be recommended. I have seen abortive fruit produced in this way and, besides, there is the danger of killing bees, which do so much to fertilize and cross-fertilize the blossoms.

There used to be an idea that spraying would poison fruit or vegetables. This especially was thought to be the case in spraying cabbage for the

cabbage worm. Our best gardeners spray cabbage with Paris Green, and analyses show that a person would have to eat about two hundred cabbage heads to get enough Paris Green to affect him. Spraying does not poison fruit and there is no danger of its doing so.

Another mistake is the thought that animals are liable to be poisoned by eating grass under trees sprayed with Paris Green or arsenate of lead. There is almost no danger in this respect. Of course there should be no grass in the orchard, unless the "sod-mulch" system is being practiced—a method that is well worth trying.

There is an idea that spraying kills bees. With lime-sulphur wash that is absolutely wrong as the wash is applied before the buds burst. With other insecticides there is no danger so long as they are not applied while the blossoms are open.

A writer for Prof. Bailey recently wrote an otherwise excellent article for his Cyclopedia of Agriculture on birds in relation to agriculture, in which he made the remarkable statement that birds are liable to be killed by modern methods of spraying. I consider this entirely false. Spraying does not kill birds, and I wrote the editor saying that if the statement were published, I should protest against it, and that others would protest it too. I am glad to learn that it was stricken out.

Many people think that if a little is good, more is better. That is a very poor belief. There is more danger from too much than there is from too little. Too much may endanger or kill the plant. Too diluted a formula may result in not accomplishing the work for which you are spraying—in not preventing the disease or killing the insect—but you will have no other loss than that of time and material and possibly continued pests; whereas, if you use too much, you are liable to injure the fruit or even kill the trees. There are certain materials of which it makes little difference if you use too much, such as the lime-sulphur mixture and the Bordeaux mixture applied when not in leaf.

The question was raised last night as to whether aphids could be killed by the lime-sulphur wash. I know it can be done as I have seen the boiled lime-sulphur wash clean up both the apple aphis and the cherry aphis, applied just before and when the buds were bursting.

It is the general opinion of operators that materials can be mixed by guess. They should be weighed and measured most carefully, to the very ounce. When I tell a man to spray 8 per cent. kerosene, I do not mean 10 per cent, and if he should use 4 per cent. or 5 per cent. above what I say he is to use, it is liable to result in injury to his trees, under certain conditions. A man should know the exact percentage to use, as well as the correct time to apply it.

There is a general impression that spraying can be done when the wind is blowing and get satisfactory results. It is almost impossible to spray against a wind. You should spray with the wind and cover that side of the tree; then you must wait till the wind has ceased or changed direction before spraying the other side. That is the only proper way to spray if windy. You cannot throw a spray against the wind, although you might use a squirt-gun or a fire hose and throw a stream or jet, but that is not spraying. The spraying material, in a fine state of division, should drift over the tree in the form of a mist, and not be thrown as a stream, and sometimes not under too great pressure. I have known of cases where so much pressure was used with Bordeaux mixture that the material was actually driven into the pores of the leaves, which were severely injured in consequence. There

is a possibility of injury by using too much power when the leaves are in a delicate or tender condition.

Q.—Would 35 pounds pressure be about right?

A.—Yes, and then you will not have this difficulty. Many people using power outfits spray at from 60 to 80 or more pounds pressure, and rarely get below 40 pounds. High pressure will not cause any injury when trees are dormant.

Many suppose that the height to which the spray is thrown depends upon the power of the apparatus. That is not so. What is required more than anything else for very high trees is sufficient length of hose and an extension rod, with ladders for operators to climb.

Efficient spraying cannot be done with poor, cheap hand apparatus. For the average orchard I would not recommend anything cheaper than a good barrel sprayer.

Many men seem to think that one spraying should be enough. Some write me: "I sprayed my trees once, and the scale is there still; I am disgusted with the formula you recommend." It takes more than one dose of medicine to cure a disease, and more than one spraying to overcome scale.

If we can control the San José scale, and produce first fruits without much expense that ought to be sufficient to satisfy us for the present; we can never get rid of it entirely. Do not think you can spray two or three infested trees in an orchard and leave the rest. Under such conditions all the trees should be sprayed, being sure of the second or re-touching spraying.

Some think they can modify the formula recommended and get better results. It is not safe to attempt it.

The following facts are not generally known:—

That sprayed fruit keeps longer than unsprayed, without damage.

That sprayed fruit stays on the trees much longer than when unsprayed.

That some diseases are not to be prevented by spraying, namely, apple and pear blight and peach yellows.

The operation should be for a definite object; we should know for what we are spraying, and then spray thoroughly at the right time with the right material, in the right proportions, with the proper apparatus. This is a very important thing. Spraying is not in itself sufficient to produce good fruit; we must have cultivation, pruning, and thinning of fruit, and finally we must spray as the most satisfactory means of controlling insect pests and preventing plant diseases.

Q.—Do we understand you to say that spraying will not prevent leaf curl?

A.—It will prevent it, but not cure it after it has started; after the leaf has started to curl, it will not cure it. There is a difference between prevention and cure.

Q.—How soon after the leaves are off is it safe to spray?

A.—At least ten days should elapse after the leaves are off. The base of the petiole of the leaf leaves a deep surface scar, and until this heals over it is not advisable to spray. (This refers to fall spraying for scale insects). In spraying for codling moth, in spring, the important point is to spray just after the petals fall, and then again in ten days' time. Some of our growers are getting 98 per cent. perfect fruit. You may use Paris Green and Bordeaux mixture together, although I believe arsenate of lead is more effective and nearly as cheap as Paris green; but a good unadulterated Paris green is excellent.

Q.—What do you use for oyster shell bark louse?

A.—I have seen bad infestations entirely cleaned out by one double spraying of lime-sulphur wash in the fall of the year. This mixture will kill all the scales, and also the cigar case-bearer, eggs of the tent caterpillar, aphids, and many other insects.

Q.—What do you mean by double spraying?

A.—Two coats; after the first coat is dry, give the trees a retouching spray. This is especially necessary in spraying for San José scale. We have growers who are spraying every year because the lime-sulphur wash has such a tonic effect on the trees, although it may not be absolutely necessary in order to keep the scale in check.

Q.—Do you recommend scraping?

A.—I do not think it is necessary so far as scale is concerned.

Q.—Does it injure the tree?

A.—It can, if too deep. You should not scrape so deeply as to injure the bark.

Q.—Is salt of any value in the lime-sulphur mixture?

A.—It is not necessary, and we do not recommend it. When salt is added to this mixture there is sometimes injury to peach twigs and buds by spraying just after the leaves fall.

We are in the midst of experiments with sulphur-soda wash as a treatment for San José scale. Our first experiments killed the fruit buds, and we have not experimented far enough for me to say just what strength should be used with safety. My opinion is that it should be about as follows: 4 lbs. caustic soda or concentrated lye, or even washing soda, boiled with three times as much sulphur for an hour, and diluted with 40 or 50 gallons of water.

REPORT OF COMMITTEE ON RESOLUTIONS.

Mr. W. H. Bunting, Chairman, presented the following report from the Committee on Resolutions:

That this Association desires to express its appreciation of the value of the work carried out in the past through the experimental fruit stations, and hopes that this work may be extended and enlarged; that we would respectfully suggest as the line along which extension take place, that the new Jordan farm be made the source of supply from which new fruits, tested or developed there, shall be sent out to the local stations for the purpose of testing their adaptability to the various localities; and, finally, that the Director of the Jordan Station be made general supervisor of the local stations, subject to the direction of the Board of Control as to the work both at Jordan and at the local stations.

That this Association desires to express its cordial approval of the Fruit Marks Act, and of the manner in which the same has been administered under the direction of Alexander McNeill, Chief of the Fruit Division of the Dominion Department of Agriculture. We believe the high standing secured by the Canadian apple in the markets of Great Britain is largely due to the Fruit Marks Act and the work done under it.

That the Association tenders its thanks to Professor H. A. Surface, Mr. Willard Hopkins, of Youngstown, N.Y., and to the other gentlemen who have assisted in the programme.

That the Association recognizes the value of the work performed by the Canadian Industrial Association in the erection of a suitable building on the exhibition grounds for the proper accommodation of the fruit exhibits.

That the Association endorses the action of the Provincial Government in providing for a display of Ontario fruit at the exhibition of the Royal Horticultural Society in London, England.

That the Association recognizes the liberality of the Provincial Government, and the council of the city of Toronto, in providing funds for the carrying on of the Ontario Horticultural Exhibition, and the assistance of the citizens in helping to make it a success.

That the Association tenders its thanks to the retiring President, Mr. Harold Jones, for his intelligent and energetic administration of its affairs. and regrets that, owing to a change in the constitution, it is unable to avail itself of his services for another year. The results of the year's work will remain as a memorial to his industry, discretion, and public spirit.

With reference to the resolution respecting the retiring President, Mr. W. H. Bunting personally said he was sure the Association regretted their inability, owing to the change in the constitution, to avail themselves of his services for a second term. He hoped the time was not far distant when they would again see him occupying the President's chair.

Mr. Harold Jones: I feel rather embarrassed that I should have been named for what little I have been able to do during the past year. I feel very grateful to you all for your kindness in giving me this expression of your regard.

The Committee's report was then submitted to the meeting and declared carried.

It was further moved and carried: That the thanks of this Association be tendered Mr. L. Woolverton for the excellent work he has produced in the "Fruits of Ontario," and that with his name be coupled the names of Mr. W. T. Macoun, and our Secretary, Mr. P. W. Hodgetts.

EXPRESS RATES IN RELATION TO THE FRUIT INDUSTRY.

By J. L. Hilborn, Leamington.

In attempting to discuss this matter of express rates and service, I do not know that I have anything to offer that is not already well known to most of you. It is a well understood fact by all the fruit and vegetable growers who have had experience in that line, that the subject of express rates and services continually stands as a mountain between them and satisfactory returns for their products in nearly all cases where it is compulsory for them to use express services in order to deliver their crops in the hands of the consumers.

We, and no doubt many of you, have for years been attempting to secure more reasonable rates and better service. but in most cases have made but little headway. In reporting on this matter, from the standpoint of the Leamington grower, I might state that we have three express companies represented in Leamington, who. of course. all have the same rate, and no very great difference in the service rendered. As far as I am able to judge, the difficulty rests more largely with the respective railroads, over which the express companies operate. than with the express companies themselves. It is at least pretty equally divided. The different railroads, under whatever name they operate, all seem to work with the same end in view, which is to get all possible out of the business for themselves. To my mind, the express companies, probably on account of considerable rivalry between the

respective companies to secure the bulk of the business, pay their respective agents a much larger percentage than is consistent with the price obtained by the grower for the labor of producing the crop. As far as I am able to learn, the person acting as agent at the shipping point receives ten per cent. of all charges, while the receiving agent at the distributing end receives the same commission. I have been watching this matter for a number of years, in connection with the shipping of my own products, and have always considered that the representatives of the express companies were receiving a much larger percentage for their labor than the service warranted. This has a tendency to stimulate the agents to hold the prices up, as well as to endeavor to secure all the business possible for their companies, and to bill goods always at the highest maximum rate. There are a number of us shipping from Leamington, who send daily through the summer season from an average of perhaps three thousand pounds up, each day. Counting this at a minimum average, it would net the billing agent fully two dollars per day, as a commission for billing this amount of stuff from each shipper, which would probably require about ten minutes' time. When we consider that the distributing agent at the other end receives another rake-off of ten per cent., making about four dollars per day for each individual small shipper, as we are here, for about ten minutes' labor at either end, we consider it an injustice, and as there are a large number of such shippers here, this aggregates a large amount. It is in this manner that the respective agents receive a large portion of their yearly salary, as at all points where there is a considerable quantity of goods to be shipped by express, the railroad companies pay their agents but a very small salary, with the understanding that they receive their pay through these express commissions.

As the leading stockholders of the various express companies are the same stockholders who own and control the railroads over which the respective express companies operate, it is to be expected that they would operate hand in hand. This is the great difficulty in getting a solution of, and a remedy for, the serious grievances which are continually facing the man who is compelled to use these companies, in order to place his goods on the market. The various express companies operating from Leamington have an agreed tariff, and all receive and deliver at the one price, whether carried entirely by one company, or as often happens, two companies may be used, in order to reach the destination. This season, we have been very seriously handicapped by the action of the Candian Express Co., who are not represented at Leamington, and who demand a full tariff from the transfer point, which in this case is London, to the point of distribution, at all points where they have exclusive power, at such points. They will carry goods to competitive points and meet the ordinary tariff used by the different companies, but will not do so where they have full control. This has been the means of practically all the shippers from Leamington losing their trade to exclusive Canadian points, as our customers at such points were compelled to pay a full tariff from Leamington to London, over one route, and from London to distributing point over the Canadian Express. This we consider very unfair. The matter was taken up by the Leamington growers early in the season, when we made every possible effort to secure a remedy, but were unable to command any better terms.

The growers in the Leamington district are fairly well satisfied with the services rendered by the Dominion Express Co., while it is fully acknowledged that the charges are more than they should be for such service. They have usually shown a disposition to settle claims and adjust wrongs, which is more than the most of us will admit in connection with some other com-

panies. The extravagant prices demanded for carrying the goods is, as a rule, no guarantee of careful handling or safe delivery of same. A number of Leamington growers this season formed a co-operative association, and packed and shipped all goods from a central packing house, for which I happened to be manager and salesman. As we distributed goods to so many different points throughout Canada, we received a very great number of complaints from our customers regarding the exorbitant charges, and also the damage sustained by goods, caused by rough handling, and we are convinced beyond all shadow of doubt that the services rendered bear no comparison to the tariff charged therefor.

Our express rates to nearly all points are about double the freight rate, and in many cases it is much more than this. Our express rate to Winnipeg is $2.90 per hundred, while we can ship by freight, in car lots, at sixty-six cents.

I am at a loss to suggest definitely any means of compelling the express companies to give better service and more reasonable charges; I say "compel," as it would appear that is the only word. If we could induce the railroad commission to investigate thoroughly this question, I am convinced they would agree with the fruit shipper that existing conditions are unfair to him, and compel them to give us some remuneration for the severe losses to ourselves, caused by their reckless handling of our goods, after receiving extravagant prices for handling same; and would also, if possible, compel the express companies to give us better service and a more reasonable tariff.

E. D. Smith, Winona: The relationship between the express companies and the fruit industry is of course very intimate, and the safety and cheapness with which these companies carry our fruit makes at times the whole difference between profit and loss. I might talk to you by the hour of the grievances and troubles we have had and still have. I might show how, in some cases, trade might be doubled if rates were lowered, but it strikes me that any amount of discussion we may have here will accomplish nothing. What we want is a strong committee appointed by this Association to take the matter up before the Railway Commission. The Commission will, I believe, take the question into consideration soon. They have power to deal with this matter. If we want our grievances remedied, there is only one way to do it, and that is to go before the Commission with a strong case, and be thoroughly prepared to establish it. This is not easy, and it cannot succeed unless the Commission is made strong enough and big enough to investigate the express and freight business from the bottom up, and ascertain whether the companies concerned are making undue profit or not. I have often complained to express companies that the rates were too high. They would say when I had concluded: "We wish we could give you a lower rate, you are a large customer, but we cannot do it; we are only making six per cent. on the capital invested in our company, and we are struggling day and night to do that; what more can you ask?" But how do we know that they are only making six per cent.? The only way to do is for the Railway Commission to go into the books of the railway and express companies, and ascertain whether or not they are making excessive profits. If they are not, no one can ask them to lower their rates. But we must, if we expect to get any reduction and better accommodation, state our case before the Board and state it strongly. We have a transportation committee to deal with these matters, and I would suggest that they take this matter up with the Commission.

J. L. Hamilton, Clarkson: This question of express service and rates in my opinion overshadows every other question that has been brought before

this convention. There are a great many things to be done and details to be threshed out which cannot be gone into here, and I trust that a very strong committee will be appointed to deal with the matter.

We, at Lorne Park and Clarkson, are the last shipping points for small fruits to Toronto on the Toronto-Hamilton line. We in that district are largely interested in strawberries and other small fruits, and ship at a time of the year when it is of vital importance to the business that our product should be placed upon the market as quickly and handled as carefully as possible. There is an old saying that the last shall come first, but in this case it is very far from the fact. We have three trains daily that carry our fruit to market. Both at Lorne Park and at Clarkson the express agents are girls, and can give no assistance in handling consignments. There is one man in the car whose duty it is to take charge of the produce, receiving it and storing it away. That man renders little or no assistance. Therefore the shipper has not only to wait often for a considerable time at the station in order to put his product on the train, but has to have two or three men in the car to see that it is stored away. Even then the train frequently pulls out leaving part of the fruit on the platform to spoil. Delegations have been sent to the Canadian Express Company to ask them to remedy this condition. They have come home thinking that possibly things were going to be done. Last year, first of all, the express rates, which were considered fairly high in that district, were increased twenty per cent. The Company said then that they intended to give us more adequate service. What was the result? Men who have been shipping for the last twenty years state that the service was never so indifferent as during the present season. The fact that the fruit is often left on the platform is, I believe, largely due to the companies' employees, and I believe it is in the interest of the companies as well as of the fruit growers that this business should be cultivated. If there is any way by which details can be regulated so that we can get better service, I think it is an important point to bring before the Commission.

I do not know that it is necessary to go into all the details. What we want is, first, that the rate be restored to what it was previous to last year; second, that the cars should be large enough to receive the shipments, and not have our fruit left on the station platform, and third, that the employees of the company should be so instructed that they will not consider they are conferring an honor on the fruit growers by taking their stuff, but rather the other way.

Mr. Alex. McNeill, seconded by Mr. Bunting, moved that the following constitute the Transportation Committee for the ensuing year: Messrs. W. H. Bunting, St. Catharines; J. L. Hamilton, Clarkson; R. W. Grierson, Oshawa; E. D. Smith, Winona; R. J. Graham, Belleville; Wm. Randall, Grimsby; J. L. Hilborn, Leamington, and the Secretary of the Association. The motion was put to the meeting and declared carried.

THE NECESSITY FOR AN IMPROVED FRUIT MARKET AND TERMINAL FACILITIES AT TORONTO.

By H. Dawson, Toronto.

A number of charges can be made against the fruit market at Toronto as not being a place suited to the handling of fruit. In the first place, the appearance of the market is very much against it. I have often felt

ashamed when I have been compelled to take large shippers from the United States and Canada to see our market, because I could not show them respectable market premises.

The second complaint against it is that the accommodation is insufficient for handling the business. There should be sufficient room to display every shipment properly. I have seen times when I have had to pile fruit from twelve to fourteen baskets high. This means a serious loss to the shipper, not only because of the damage done to the fruit and baskets, but also because of our inability to display it properly to buyers.

In the next place, the market conditions are unwholesome. After every rainstorm there are pools of water lying underneath the market. If any board of health were to inspect it, they would, I am sure, condemn it.

You have stated a number of grievances that the fruit men have against the express companies. Another one can be added in this connection; the express companies do not deliver the fruit properly into the market, the main reason being that they will not hire sufficient competent help to enable them to do so, and from the manner of checking it off, it is a wonder there are not more shortages than at present. We do not know how many packages are coming from the consignor, and as we have no way of checking them, we do not know whether there are shortages or not until after we have made a report to the shipper. In some cases the shipper puts in a slip or drops us a card to let us know, but as a rule this is not done. The express company has a bill of the goods, and they should be compelled to give us a memo. of them. When the goods arrive at Toronto, the express companies often do not deliver them until late in the day, owing to insufficient help, which does not give us a chance to handle it to advantage.

The question arises then, how can the fruit market be improved? Several plans have been suggested. I think, however, that the city should have full control of the market and should provide an adequate building. I think that everybody who has occasion to occupy the building would be willing to pay a reasonable rental, which would afford a revenue to the city.

The city possesses a property at St. Lawrence Market which they could convert, with no very great expenditure, into a fruit market. By that expenditure they would be increasing the value of the property around them, of which they own a considerable quantity, and could add to the revenue by necessary ground rentals, taxes, etc. Even if they did not get any direct revenue from the fruit market itself, they would be compensated indirectly for any expenditure. With ample market accommodation considerable fruit that is now sent elsewhere would come to Toronto. This would have a tendency to bring together buyers and make it more of a produce market than it is to-day. The men from the small outlying towns would prefer to come to Toronto to buy their fruit, rather than have it shipped to them direct by the growers on commission, for the reason that they do not know on what day they are going to receive stuff; consequently they are out of fruit half the time. This would not occur if they were compelled to come to Toronto to buy.

In case the city does not do so, a private corporation might undertake to erect a building. Such a corporation should not have any interest in the carrying companies. That is one of the drawbacks of the present market: It is controlled by one carrying company alone, although presumably by two—the Grand Trunk and the Canadian Express—the Dominion Express paying toll to the Grand Trunk on every package. On the goods we bring off the boats, we have to pay toll out of our commission.

Some people have suggested that a market should be erected south of the tracks; I do not think that is necessary. Even if we had to go farther away from the centre of the city than we are, it would not make much difference; the trade could come. The quantity of fruit that came by boat last season was less than ten per cent. of the whole, and 75 per cent. of that 10 per cent. was hauled by the commission men themselves from the boat to the market. The boat trade therefore cuts a comparatively small figure.

There will be a time when the radial lines will have access to our city, and when they do, I think I am safe in making the assertion that the greater portion of the goods will be brought in by them. This will be more convenient to the fruit grower who will have the cars running near his own door, and do away with many of the complaints against the express companies.

Controller Hubbard, Toronto: During Exhibition time when I discussed this matter with Mr. Bunting, I told him that if the Association would send a Committee to wait upon the Council, we should be very glad to consider whether something could not be done to remedy the evils complained of. I think the complaints are well founded. We, as a corporation, are not responsible for the present condition of affairs. In the past, the Council appointed a special committee to look into this matter and see what could be done. I regret to say that we did not receive very cordial sympathy or support from those engaged in the business, and it might be only reasonable to expect the initiative in this matter to be taken by them.

The fruit business is one of great magnitude, and of the greatest importance to the city. Fruit comes here because, with the population surrounding Toronto, we have over three hundred thousand people to eat fruit. Toronto is also, from its situation, the best distributing point.

I do not know what influence the companies have in the matter. Perhaps they prefer the present market because they can run in their cars at a minimum of expense, but a more unsuitable place in which to show the fruit of this province to the people who go there, I defy you to find. It is dark, dirty, and unsanitary.

Fortunately the city owns a large amount of land on the lake front. At the present time there is a large dock at the foot of Yonge Street that is unoccupied except by tramp steamers, which might be used in connection with Bayside Park, which would form an admirable location for a fruit market. If a suitable fruit market were built there it would be convenient both to railways and boats. The fruits growers are not looking for any particular generosity at the hands of the citizens, but simply for justice when they come here to dispose of their wares. I believe that if a committee of the fruit growers and commission merchants were appointed to take the matter up with the Toronto City Council, some good and satisfactory results would follow. Would back up such a committee with the Council, and I do not believe from my knowledge of the members of the present Council that they would refuse to take the matter up. It concerns not only the fruit grown in this Province, but also the fruit we import during the winter season from other parts. If a fruit market were established here, owned by the city, you would always be safe, and we should be satisfied with the indirect benefit.

Controller Hocken, Toronto: I have not been in the City Council so long as Mr. Hubbard, nor have I had to do with this question as he has had. He speaks with a good deal of authority. So far as I am concerned, anything I can do at any time to provide better facilities for this rapidly growing trade, I shall be glad to do. I appreciate what Mr. Hubbard has

said about the demand of our citizens for fruit—the best fruit and fruit in good condition. It is entirely unsatisfactory to the consumer that the fruit he buys should be handled in the way it is at the present time, and must be so long as the present market continues. You may count on my very sympathetic assistance, so far as I can render any aid as a member of the Council.

Alderman Chisholm, Toronto: In anything that may be done in this matter, there is one important thing to be borne in mind and that is the way by which the radial railways will come into Toronto. I am inclined to think that the St. Lawrence market with some repairs and alterations would meet the case admirably so far as location is concerned.

As regards civic control, I think that is on the right line. We hear a great deal now about municipal control, but I think that the markets at all events should be controlled by the city.

Mr. R. C. Harris, Property Commissioner, Toronto: I came here merely in the capacity of a listener that I might hear what were the views of your Association regarding the matter. These views will assist me in arriving at a conclusion should the matter come before me, as it undoubtedly will do.

I fully agree with those speakers who pointed out that the bulk of the fruit would in the next few years come into the city by means of the radial railways. An enormous trade could be developed in that way. The St. Lawrence market would be the natural terminus for those lines. Although Mr. Dawson states that only ten per cent. now comes by boat. I think that when the radial lines take effect, that percentage will be very much reduced. Some time since the city took active steps to see if they could not improve the conditions of the fruit business. They approached the navigation companies in the matter and were informed that, in the event of the city building a wharf at the foot of Jarvis Street, they could not see their way to stop incoming steamers there to unload fruit. This suggested a slow light line of boats that would land fruit in Toronto early each morning from the various shipping ports on the Lake. The Company absolutely refused to do anything of the kind, however.

We then went to the Grand Trunk, as that company practically has the control of the terminal. They were quite frank about it. They said, "we control the terminal and the trade, and propose to continue to do so. Go ahead with your market if you wish, but we will not run lines into it, and just the moment we have competition we will throw off our charges, and, if needs be, provide better quarters. It seems hardly likely that the commission men and business men would care to pay us a rental sufficient to pay the annual charges on any outlay that might be made in this connection if they were to receive an offer of free accommodation from the railway.

This is the position we are placed in at the present time. I feel sure that if a committee were appointed by this Association, the Board of Control and members of the Council would be very glad to co-operate with them. Along what lines this could be effected I am not prepared to say, as I may later on be called to pronounce upon the matter.

Wm. Armstrong, Niagara: There is no question in my mind that a fruit and vegetable market would be one of the best assets the city ever had. If the railways and steamboat people will not come to terms with the corporation, then, I think something will happen very shortly. What will I do for instance as a grower? I am not going to continue to send my fruit to the terminus we have here, and have it abused as it has been for the past ten

years. There are other markets opening up for my fruit, with the best facilities for handling it, and they shall get it if circumstances do not change. The question is a vital one in our township, because the fruit growers come here frequently to see the manner in which their fruit is handled. There is but little inducement to produce the finest fruit, if, by the time it reaches the consumers' hands, it is in more or less of a damaged condition. This should be remedied and must be.

W. H. Bunting, St. Catharines: As a very frequent shipper to the city, I wish to express my appreciation of the manner in which this subject has been received by the city representatives. I regard it as one of vital importance to the fruit interests and to the citizens. I cannot help but say at this juncture that we as fruit growers thoroughly appreciate the splendid reception we have had from the city for the past four years in connection with the bringing here of an annual convention and the establishment of a Fruit, Flower, Honey and Vegetable Exhibition, which we are endeavoring to hold in Massey Hall. We have been able to do that largely because the City Council have willingly and freely acceded to our requests for assistance. One of the city's representative stated that in his opinion the initiative in this matter of market accommodation ought to come from the dealers. I think he is quite correct in that, but the statement has reached me in an indirect way that the dealers were not altogether in harmony as to the methods by which this matter could be adjusted.

Fruit growers who ship frequently to this market, and who have time and again suffered hardship from the inadequate facilities feel that some effort must be made whereby the matter can be brought to the notice of the City Council, the dealers and the railway companies with a view to a remedy being found for the present state of affairs. I am glad to see that the representatives of the city are so willing to join with us in everything that will increase the reputation of the city, and redound to the fruit interests, and I think we are in a fair way to secure some improvement.

With reference to the Grand Trunk holding the key to the situation, I must take exception to that. I do not think that we as growers and users of transportation companies will submit to the dictates of any carrying company as to where and how we shall place our fruit. We have a tribunal before whom to bring such matters, and it seems to me that it would be an opportune time to bring it to their attention when they come to take the matter of terminals into consideration.

Mr. Dawson: A few years ago the Grand Trunk proposed placing a toll upon everything whether it came over their own road or not. The commission men thought it was an injustice, and one day they all moved out. The company finally compromised by agreeing to take the toll off everything that came by their road.

Mr. Bunting: For the information of the gentlemen from the city council, I may say that, briefly, our needs are as follows: That proper facilities be accorded for the display and marketing of fruit, etc., and that they be located at such a point that, no matter by what road we may desire to ship our fruit, the place assigned for this purpose will be easy of access.

The Chairman enquired whether the city representative would like a committee appointed by the Association to confer with the authorities.

Controller Hubbard: That was my idea in throwing out the suggestion. Then both the growers and dealers should get together and try to agree on a proposition to be submitted to the Council.

A Commission Dealer: The wholesale fruit interests have been more neglected in Toronto than in any city of its size in America. A building

such as has been proposed would be one of the best assets the city could have. I am satisfied to move from the St. Lawrence market to any place where a fruit market may be established. It should be made a permanent market all the year round. The St. Lawrence market has no share of the fruit trade, and we could not get the Niagara boats to bring fruit to the foot of that market. As to the radial roads, the city has locked them out, and we do not know when they are going to let them in: it may be ten years or twenty. I think that the most practical place for such a market is the Bay street siding, or at the dock that Mr. Hubbard suggested. If the market is established there, I will guarantee it to be one of the best revenue producers the city has, and that it will be taken up the year round. There are some who have put a stumbling block in the way of the market. They are men who are on the main street. Those who are off that thoroughfare have to take the leavings.

There is no doubt that such a market would be a lasting benefit to the trade. At the present time we have not got market facilities for the handling of fruit and the growers lose in consequence.

Property Commissioner Harris: I wish to correct one statement—that the city has blocked the entrance of the radial railways. The city has given the terms on which they might enter: two dollars per freight car in and out, which they say they cannot afford to pay. The Ontario Railway Act contains the provision that if the city and the railway cannot come to an agreement, then they may go before the Railway Commission, and the Commission may dictate terms, and the city is bound to accept. The machinery does not allow the city to take the initiative. We have repeatedly asked the radial companies to go to the Commission if they are not satisfied with our terms. The difficulty is that the radial companies desire to obtain certain running rights beyond the date of the expiry of the present franchise, which we are not willing to permit. This is the reason they will not come into the city. The city is anxious for them to come in.

It was then moved by Mr. W. H. Bunting, seconded by Mr. H. Dawson, and carried, that the following constitute a committee to deal with the matter, viz., Messrs. H. C. Fisher, Wm. Armstrong, J. L. Hamilton, and the mover.

BUSINESS SYSTEMS FOR CO-OPERATIVE ASSOCIATIONS.

By C. E. Bowerman, of the Copeland-Chatterson Co., Toronto.

I want to bring to your notice a system of bookkeeping suited to the requirements of co-operative associations of fruit growers. I understand that what is required is a uniform system for all the associations, and one that is simple enough to be easily worked out by the officers of those associations. I will endeavor to lay before you briefly the system devised for this purposes by the firm I represent.

First of all the triplicate receiving blanks would, I think, apply. When this form is filled out, the first copy is handed to the farmer, who, as a member of the asociation, has delivered certain produce. The second copy is the accounting record. The third may be dealt with in two ways; it may be handled by the order department or shipper to complete when the goods are shipped with the name of the purchaser to whom they are consigned, etc.

Later on the farmer can come back and get the exact amount he is to receive filled in on the form. Some minor alterations will need to be made in the form to meet the requirements of individual associations. All the western milling concerns use the triplicate receipt blanks, and growers are accustomed to deposit their receipts as collateral with the banks.

We next come to what is called the single shipping order ticket. This is taken to the office after it is filled out so that the accountant may credit the grower with exactly what should be credited to his account, and at the same time invoice from that to the party to whom the association is selling the goods, the exact amount required, and carry it out in the regular way as a regular invoice.

This brings us to the ledger. To take care of the business of a co-operative association, and take care of it properly, a specially ruled ledger is necessary. I have designed a ruling which is submitted herewith. Taking the debit side first. There may be extra charges for crates, barrels, etc. These items will of course be placed on that side of the account, while the credit side shows the returns. After everything has been posted, a member can at any time go to the office of the association and see how his account stands. As a rule, you cannot make much out of the ledger of commercial concerns, there being so many abbreviations and private marks.

It may be that a system with blanks such as I have described, costs a little money, but any intelligent man will agree that simplicity and system mean money saved in the long run. The ledger needs to be legible so that a member can see exactly where he stands.

From the ledger we come to the billing system. The sample form submitted is used by the Grimsby Association. It is what we term a "fold-over bill charge blank," and is made in duplicate. The outside sheet is torn off and goes to the purchaser. The inside sheet is placed in a binder, and from this you post to the ledger the amount the association charges to the party to whom the goods are sold. Instead of keeping three ledgers as some association do, one only is required under this system. The ledger may be divided into three compartments if desired. I think that the debit and credit side of the accounts cover the whole idea.

From the billing system we come to the synoptic cash book. This is a combination of day book, journal and cash book. There is not an entry you can bring up that cannot be posted in it. I do not care what line of business you bring up or what your ideas are so far as indirect posting is concerned, this book will meet all requirements. This book will take care of goods coming in, and of cash received, cash paid out, exchange, etc. Finally the details are posted once a month into the ledger; the back of the ledger being reserved for special accounts.

One more item: The duplicate account sales blanks, to be used only in the event of goods being sold by consignment.

We shall be glad to receive a call from any member of your Association at our offices in this city, and show our books and explain everything.

The Chairman suggested that the Co-operative Committee should look into the system and ascertain whether it would meet the requirements of the co-operative associations.

APPENDIX.

FRUIT PRIZE LIST AT ONTARIO HORTICULTURAL EXHIBITION, 1907.

APPLES.

Class 1. Export or Foreign Market Varieties.

(*a*) Barrels ready for shipment.

Baldwin: 1st, Norfolk F.G.A.; 2nd, Chatham F.G.A.; 3rd, Jas. E. Johnson, Simcoe.
Ben Davis: 1st. Harry Dempsey, Rednersville; 2nd, Belleville F.G.A.; 3rd, Oshawa F.G.A.
Golden Russet: 1st, Chatham F.G.A.; 2nd, Frank Dempsey, Albury; 3rd, Norfolk F.G.A.
Greening: 1st, Norfolk F.G.A. 2nd, P. C. Dempsey, Trenton; 3rd, C. W. Challand, Marburg.
King: 1st, Norfolk F.G.A.; 2nd, Oshawa, F.G.A.; 3rd, P. C. Dempsey.
Spy: 1st, Jas. E. Johnson; 2nd, Norfolk F.G.A.; 3rd, Belleville F.G.A.
Stark: 1st, Frank Dempsey.

(*b*) Standard boxes ready for shipment. (Fruit unwrapped.)

Baldwin: 1st. Chatham F.G.A.; 2nd, R. Thompson, St. Catharines; 3rd, Norfolk F.G.A.
Fameuse: 1st, R. Thompson; 2nd, Harold Jones, Maitland; 3rd, Norfolk F.G.A.
Golden Russet: 1st, Chatham F.G.A.; 2nd, R. Thompson; 3rd, Norfolk F.G.A.
Greening: 1st, Robt. Thompson; 2nd, Oshawa F.G.A.; 3rd, Norfolk F.G.A.
King: 1st, Oshawa F.G.A.; 2nd, R. Thompson; 3rd, Norfolk F.G.A.
McIntosh: 1st, Oshawa F.G.A.; 2nd, Frank Dempsey; 3rd, Harold Jones.
Spy: 1st, R. Thompson; 2nd, Jas. E. Johnson; 3rd, Norfolk F.G.A.

(*c*) Standard boxes ready for shipment. (Fruit wrapped.)

Fameuse: 1st, R. Thompson; 2nd, Oshawa F.G.A.; 3rd, Harold Jones.
Gravenstein: 1st, Oshawa F.G.A.
King: 1st, Biggs F. and P. Co., Burlington; 2nd, Oshawa F.G.A.; 3rd, Chatham F.G.A.
McIntosh: 1st, Oshawa F.G.A.; 2nd, Norfolk F.G.A.
Spy: 1st, Norfolk F.G.A.; 2nd, Biggs Fruit Co.; 3rd, F. G. Stewart, Homer.
Wealthy: 1st, Oshawa F.G.A.

Class 2. Domestic or Home Varieties.

(*a*) Barrels ready for shipment.

Blenheim: 1st, Oshawa F.G.A.
Gravenstein: 1st, Oshawa F.G.A.
Ontario: 1st, Frank Dempsey; 2nd, P. C. Dempsey; 3rd, Belleville F.G.A.
Tolman: 1st, Belleville F.G.A.; 2nd, Norfolk F.G.A.
Roxbury Russet: 1st, R. Thompson, 2nd, Norfolk F.G.A.; 3rd, Frank Dempsey.
Barrell, A. O. V., not named in Class 1: 1st, Norfolk F.G.A.; *Hubbardston*: 2nd, Harry Dempsey; 3rd, Belleville F.G.A.

(*b*) Standard boxes ready for shipment. (Fruit unwrapped.)

Blenheim: 1st, Oshawa F.G.A.
Gravenstein: 1st, Oshawa F.G.A.
Ontario: 1st, Frank Dempsey; 2nd, Harry Dempsey.
St. Lawrence: 1st, Oshawa, F.G.A.
Any other desirable variety not named in Class 1: 1st, C. W. Challand; 2nd, Norfolk F.G.A.; 3rd, Chatham F.G.A.

Class 3. Dessert Varieties. Plates of 5.

Fameuse: 1st. F. G. Stewart, Homer; 2nd, R. Cameron, Niagara Falls South; 3rd, Norfolk F.G.A.

Golden Russet: 1st, Chatham F.G.A.; 2nd, A. E. Tenbroeck, St. Catharines; 3rd, W. G. Watson, Dixie.
King: 1st, N. Brown, Eglinton; 2nd, W. G. Watson; 3rd, Norfolk F.G.A.
McIntosh: 1st, Frank Dempsey; 2nd, A. M. Smith, Port Dalhousie; 3rd, C. L. Stephens, Orillia.
Wealthy: 1st, J. B. Gutthrey; 2nd, W. G. Watson; 3rd, R. W. Thomson.
Spy: 1st, C. W. Challand; 2nd, N. Brown; 3rd, F. G. Stewart.
Spitzenburg: 1st, Norfolk F.G.A.; 2nd, C. W. Challand; 3rd, J. Tregunno & Sons, Bartonville.
Any other variety: 1st, R. W. Thomson, Ellesmere; 2nd, J. Tregunno & Sons; 3rd, W. W. Cox, Collingwood.
Any desirable Seedling: 1st, G. A. Robertson, St. Catharines; 2nd, P. C. Dempsey.

Class 4. Cooking Varieties. Plates of Five.

Alexander: 1st, Jno. D. McDonald, Cornwall; 2nd, P. C. Dempsey; 3rd, W. G. Watson.
Baldwin: 1st, R. Thompson; 2nd, N. Brown; 3rd, P. C. Dempsey.
Blenheim: 1st, J. B. Gutthrey; 2nd, W. G. Watson; 3rd, W. C. Reid, Belleville.
Cayuga: 1st, Norfolk F.G.A.; 2nd, J. G. Brown, Humber Bay; 3rd, J. Tregunno & Sons.
Greening: 1st, P. C. Dempsey; 2nd, W. H. Stevenson, Oshawa; 3rd, J. Tregunno & Sons.
King: 1st, C. W. Challand; 2nd, Chatham F.G.A.; 3rd, Norfolk F.G.A.
Ribston: 1st, A. R. Davison, Danforth; 2nd, A. W. Peart, Burlington; 3rd, Chas. Plunkett, Woodbridge.
Spy: 1st, C. W. Challand, Marburg; 2nd, Norfolk F.G.A.; 3rd, R. Thompson.
Any other desirable variety: 1st, Jno. L. Grosjean, Cobourg; 2nd, W. G. Watson; 3rd, C. W. Challand.
Any desirable Seedling: 3rd, P. C. Dempsey.

Class 5. Pyramids of Fruit.

Ben Davis: 1st, J. Tregunno & Sons; 2nd, Chatham F.G.A.; 3rd, W. G. Watson.
Baldwin: 1st, W. G. Watson; 2nd, Jas. E. Johnston; 3rd, J. B. Gutthrey.
Blenheim: 1st, W. G. Watson; 2nd, J. B. Gutthrey; 3rd, J. G. Brown.
Gravenstein: 1st, Oshawa F.G.A.
Fallawater: 1st, H. B. Gutthrey; 2nd, Chatham F.G.A.
Fameuse: 1st, J. B. Gutthrey; 2nd, Harold Jones; 3rd, P. C. Dempsey.
King: 1st, Oshawa F.G.A.; 2nd, A. R. Davison; 3rd, W. G. Watson.
McIntosh: 1st, G. C. Caston, Craighurst; 2nd, W. G. Watson; 3rd, W. M. Robson, Lindsay.
Ontario: 1st, P. C. Dempsey; 2nd, W. G. Watson; 3rd, J. B. Gutthrey.
Scarlet Pippin: 1st, G. C. Caston; 2nd, Harold Jones.
Spy: 1st, Jas. E. Johnson; 2nd, C. W. Challand; 3rd, W. G. Watson.
Wolf River: 1st, G. C. Caston; 2nd, Walter Forrester, Rugby.

PEARS.

Class 6. Plates of 5.

Anjou: 1st, R. Thompson,; 2nd, W. F. W. Fisher, Burlington.
Bosc: 1st, A. M. Smith, Port Dalhousie; 2nd, F. G. Stewart.
Clairgeau: 1st, Bernard Baker, Whitby; 2nd, F. G. Stewart
Diel: 1st, A. M. Smith; 2nd, F. G. Stewart.
Duchess: 1st, W. F. W. Fisher; 2nd, F. G. Stewart.
Hardy: 1st, J. G. Brown.
Howell: Bernard Baker; 2nd, A. M. Smith.
Keiffer: 1st, A. E. Tenbroeck, St. Catharines; 2nd, F. G. Stewart.
Lawrence: 1st, R. W. Newton; 2nd, A. M. Smith.
Winter Nelis: 1st, F. G. Stewart; 2nd, R. Thompson.
Any other variety: 1st, A. M. Smith; 2nd, J. G. Brown, Humber Bay.

Class 7. Export Varieties.

Boxes ready for shipment. (Fruit wrapped.)

Anjou: 1st, Geo. A. Robertson; 2nd, R. Thompson; 3rd, Biggs Fruit Co.
Bosc: 1st, F. G. Stewart; 2nd, R. Thompson; 3rd, Geo. A. Robertson.
Clairgeau: 1st, F. G. Stewart; 2nd, Geo. A. Robertson; 3rd, R. Thompson.
Duchess: 1st, R. Thompson; 2nd, F. G. Stewart; 3rd, Geo. A. Robertson.

Winter Nelis: 1st, F. G. Stewart.
Keiffer: 1st, A. E. Tenbroeck; 2nd, W. H. Bunting; 3rd, F. G. Stewart.
Lawrence: 1st, R. Thompson.
Any other variety: 1st, F. G. Stewart; 2nd, Geo. A. Robertson; 3rd, R. Thompson.

GRAPES.

Class 8.

Agawam: 1st, R. Thompson; 2nd, W. M. Robson, Lindsay: 3rd, F. G. Stewart.
Concord: 1st, R. Thompson; 2nd, F. G. Stewart; 3rd, Geo. A. Robertson.
Lindley: 1st, Geo. A. Robertson; 2nd, F. G. Stewart; 3rd, R. Thompson.
Niagara: 1st, R. Thompson; 2nd, F. G. Stewart; 3rd, Geo. A. Robertson.
Vergennes: 1st, F. G. Stewart; 2nd, R. Thompson; 3rd, Geo. A. Robertson.
Wilder: 1st, Geo. A. Robertson; 2nd, F. G. Stewart; 3rd, R. Thompson.
Any other desirable variety: 1st, R. Thompson; 2nd, W. M. Robson; 3rd, F. G. Stewart.
Basket Black Grapes: 1st, F. G. Stewart; 2nd, R. Thompson; 3rd, Geo. A. Robertson.
Basket Red Grapes: 1st, Geo. A. Robertson; 2nd, F. G. Stewart; 3rd, R. Thompson.
Basket White Grapes: 1st, Geo. A. Robertson; 2nd, F. G. Stewart; 3rd, R. Thompson.
Fancy Package, Black Grapes: 1st, Geo. A. Robertson; 2nd, R. Thompson; 3rd, F. G. Stewart.
Fancy Package, Red Grapes: 1st, R. Thompson; 2nd, F. G. Stewart; 3rd, Geo. A. Robertson.
Fancy Package, White Grapes: 1st, Geo. A. Robertson; 2nd, F. G. Stewart; 3rd, R. Thompson.

Class 9.

Display in Commercial Packages: 1st, Norfolk F.G.A.; 2nd, St. Catharines Cold Storage Co.; 3rd, Grantham, F.G.A.
Display (not in Commercial Packages): 1st, St. Catharines Cold Storage Co.; 2nd, Norfolk F.G.A.; 3rd, Grantham F.G.A.; 4th, Orillia Hort. Society.

PRESERVED FRUIT.

Class 10. Quart Sealer of Canned Fruit.

Blackberries: 1st, Mrs. T. Delworth, Weston: 2nd, Miss E. Gregory, Port Dalhousie; 3rd, Mrs. P. Depotie, St. Catharines.
Cherries, Black and Red: 1st, W. A. Emory, Aldershot; 2nd, Mrs. R. Thompson, 3rd, Mrs. F. G. Stewart.
Cherries, White or Yellow: 1st, Miss E. Gregory; 2nd, Mrs. F. G. Stewart; 3rd, Mrs. R. Thompson.
Gooseberries: 1st, Mrs. F. G. Stewart; 2nd, Mrs. R. Thompson; 3rd, Mrs. T. Delworth.
Grapes, Black or Red: 1st, J. G. Wait, Wicklow; 2nd, Mrs. P. Depotie; 3rd, Mrs. F. G. Stewart.
Grapes, White: 1st, Miss E. G. Gregory; 2nd. Mrs. P. Depotie, 3rd, Mrs. F. G. Stewart.
Peaches, White: 1st, Mrs. R. Thompson; 2nd, Mrs. F. G. Stewart; 3rd, Mrs. P. Depotie.
Peaches, Yellow: 1st, Mrs. F. G. Stewart; 2nd, Mrs. R. Thompson; 3rd, Jno. Downham, Strathroy.
Pears: 1st, Mrs. P. Depotie; 2nd, R. W. Thomson, Ellesmere; 3rd, W. A. Emory.
Plums, Blue or Red: 1st, Mrs. W. H. French, Oshawa; 2nd, N. Brown, Eglinton; 3rd, Miss E. G. Gregory.
Plums, Green or White: 1st, Mrs. W. H. French, Oshawa; 2nd, Mrs. P. Depotie; 3rd, R. W. Thomson.
Raspberries, Red: 1st, Mrs. F. G. Stewart; 2nd, Mrs. R. Thompson; 3rd, J. G. Wait.
Raspberries, Black: 1st, Mrs. F. G. Stewart; 2nd, Mrs. R. Thompson; 3rd, J. G. Wait, Wicklow.
Strawberries: 1st, W. A. Emory; 2nd, Mrs. R. Thompson; 3rd, Mrs. P. Depotie.

Class 11. Pint Jar of Jam.

Currant, Black: 1st, Mrs. F. G. Stewart; 2nd, Mrs. R. Thompson; 3rd, Miss L. Shuttleworth.
Gooseberry: 1st, Miss E. G. Gregory; 2nd, W. A. Emory; 3rd, N. Brown.
Grape: 1st, Mrs. J. W. Sparling; 2nd, Mrs. P. Depottie; 3rd, Miss E. G. Gregory.
Peach: 1st Mrs. P. Depotie; 2nd, Mrs. R. Thompson; 3rd, Mrs. F. G. Stewart.
Pear; 1st, Mrs. F. G. Stewart; 2nd, Mrs. R. Thompson; 3rd, Mrs. J. W. Sparling.

Plum: 1st, W. A. Emory; 2nd, Miss L. Shuttleworth; 3rd, Mrs. P. Depotie.
Raspberry: 1st W. A. Emory; 2nd, Miss E. G. Gregory; 3rd, Mrs. R. Thompson.
Strawberry: 1st Miss E. G. Gregory; 2nd, W. A. Emory; 3rd, Mrs. F. G. Stewart.

CLASS 12. PINT OF JELLY.

Apple: 1st, Mrs. P. Depotie; 2nd, Mrs. F. G. Stewart; 3rd, Miss L. Tasker, St. Catharines.
Crab Apple: 1st, Mrs. P. Depotie; 2nd, Miss E. G. Gregory; 3rd, Mrs. T. Delworth.
Red Currant: 1st, Miss E. G. Gregory; 2nd, Mrs. P. Depotie, 3rd, Mrs. F. G. Stewart.
Grape: 1st, Mrs. P. Depotie; 2nd, Mrs. F. G. Stewart; 3rd, Mrs. R. Thompson.
Quince: 1st, Mrs. R. Thompson; 2nd, Miss L. Shuttleworth; 3rd, Mrs. T. Delworth.
Raspberry, Red: 1st, Miss L. Shuttleworth; 2nd, Mrs. P. Depotie; 3rd, Miss E. G. Gregory.

CLASS 13. GRAPE JUICE. UNFERMENTED.

1st, W. A. Emory; 2nd, Mrs. Geo. Laing, Toronto; 3rd, Mrs. J. W. Sparling, Bowmanville.

COUNTY PRIZE LIST

BRANT:
Blenheim: 1st, J. W. Clark, Cainsville.
Golden Russet: 1st, J. W. Clark.
Greening: 1st, J. W. Clark.
King: 1st, J. W. Clark.
Mann: 1st, J. W. Clark.
Spy: 1st, J. W. Clark.
Seek: 1st, J. W. Clark.

ELGIN:
Baldwin: 1st, J. D. Webster. Sparta; 2nd, Arch. Maccoll.
Ben Davis: 1st, J. D. Webster.
Fallawater: 1st, J. D. Webster.
Golden Russett: 1st, Arch. Maccoll.
Spy: 1st J. D. Webster.

ESSEX:
Baldwin: 1st, Lorna Duke; 2nd, A. S. Fox, Olinda.
Ben Davis: 1st, A. S. Fox.
King: 1st, A. S. Fox.
Spy: 1st, A. S. Fox; 2nd. Blake R. Cohoe; South Woodslee.
Roxbury Russet: 1st, Blake R. Cohoe; 2nd, A. S. Fox.
Snow: 1st, Blake R. Cohoe.
Wagner: 1st, Adolphus S. Fox.

Seek: 1st, Blake R. Cohoe.
Any other variety: 1st, Lorna Duke; 2nd, A. S. Fox.

HALTON:
Baldwin: 1st, W. McMurray, Streetsville; 2nd. R. M. Peart, Freeman.
Blenheim: 1st, Jno. Wilson, Jr.; 2nd, R. M. Peart.
Cranberry: 1st, R. M. Peart.
Golden Russet: 1st, A. C. Cummins, Burlington; 2nd, W. F. McMurray.
Greening: 1st, R. M. Peart.
King: 1st. W. F. McMurray; 2nd. R. M. Peart.
Spy: 1st, R. M. Peart; 2nd. W. F. McMurray.
Ribston: 1st, R. M. Peart.
Roxbury Russet: 1st, R. M. Peart; 2nd, R. C. Fowler, Burlington.

HURON:
Baldwin: 1st, Kenneth Cameron; Lucknow; 2nd, Wm. Geddes, Belgrave.
Ben Davis: 1st, Geo. Fothergill; 2nd, K. Cameron.
Canada Red: 1st, E. B. Jenkins, Wingham; 2nd, Geo. Fothergill, Belgrave.
Fameuse: 1st, F. E. Bingham, Goderich; 2nd, F. Hogg, Seaforth.
Golden Russet: 1st, Geo. Leithwaite.

Greening: 1st, R. G. McGowan, Blyth; 2nd, A. W. Sloan, Blyth.
King: 1st, A. W. Sloan, Blyth; 2nd, R. McIlwain, Nile.
Spy: 1st, K. Cameron; 2nd, A. W. Sloan.
Ontario: 1st, R. McIlwain; 2nd, Geo. Fothergill,
Any other variety: 1st, J. B. Henderson, Seaforth; 2nd, R. G. McGowan, Blyth.

LAMBTON:
Canada Red: 1st, Geo. A. Gott, Arkona.

LEEDS AND GRENVILLE:
Alexander: 1st, Edwin Keeler, Maitland; 2nd, J. H. Warner, South Augusta
Baxter: 1st, J. H. Warner; 2nd, W. Warner, South Augusta.
Canada Red; 1st: Wm. Beddie, Prescott; 2nd, J. H. Warner.
Fameuse: 1st, Wm. Beddie; 2nd, J. H. Warner.
Golden Russet: 1st, Edwin Keeler; 2nd, Wm. Beddie.
McIntosh: 1st, Wm. Beddie; 2nd, John Towsley, South Augusta.
Scarlet Pippin; 1st, Edwin Keeler; 2nd, Fred. Keeler, Maitland.
Scott Winter: 1st, W. Warner; 2nd, Edwin Keeler.
Wealthy: 1st, Harold Jones; 2nd, W. Warner.
Tolman: 1st, John Towsley; 2nd, Edwin Keeler.

NORFOLK:
Baldwin: 1st, Norfolk F.G.A.; 2nd, C. W. Challand, Marburg.
Blenheim: 1st, C. W. Challand; 2nd, Norfolk F.G.A.
Fameuse: 1st, Norfolk F.G.A.; 2nd, C. W. Challand.
Golden Russet: 1st, C. W. Challand; 2nd, Norfolk F.G.A.

Greening: 1st, W. F. Olds, Simcoe; 2nd, Norfolk F.G.A.
King: 1st, C. W. Challand; 2nd, Norfolk F.G.A.
Spy: 1st, C. W. Challand; 2nd, Norfolk F.G.A.
Spitzenburg: 1st, C. W. Challand; 2nd, W. F. Olds.
Yellow Bellefleur: 1st, W. F. Olds; 2nd, Norfolk F.G.A.
Any other variety: 1st, C. W. Challand; 2nd, C. W. Challand.

NORTHUMBERLAND AND DURHAM:
Alexander: 1st, P. C. Dempsey, Trenton.
Baldwin: 1st, P. C. Dempsey; 2nd, H. C. Bowen, Newcastle.
Ben Davis: 1st, W. H. Gibson, Newcastle; 2nd, P. C. Dempsey.
Fameuse: 1st, P. C. Dempsey; 2nd, J. W. Moir, Campbellford.
Golden Russet: 1st, P. C. Dempsey; 2nd, Frank H. Hall, Wicklow.
Greening: 1st, P. C. Dempsey; 2nd, H. J. Scripture.
King: 1st, H. J. Scripture; 2nd, P. C. Dempsey.
McIntosh: 1st, P. C. Dempsey; 2nd, H. J. Scripture.
Spy: 1st, P. C. Dempsey; 2nd, Jno. L. Grosjean, Cobourg.
Wealthy: 1st, Geo. E. Bamsay, Welcome.

OXFORD:
Baldwin: 1st, Andrew McKay; 2nd, R. W. Newton, Woodstock.
Colvert: 1st, Craig Harris, Ingersoll.
Fameuse: 1st, Craig Harris.
Greening: 1st, Craig Harris; 2nd, R. W. Newton.
King: 1st, Craig Harris; 2nd, R. W. Newton.
Spy: 1st, R. W. Newton; 2nd, Craig Harris.
Seek: 1st, Andrew Horner, Plattsville; 2nd, Craig Harris.
Tolman: 1st, Andrew McKay, Woodstock; 2nd, Craig Harris.

PEEL:
Baldwin: 1st, Wm. Clements, Clarkson; 2nd, W. G. Watson, Dixie.
Blenheim: 1st, J. B. Gutthrey, Dixie; 2nd, W. G. Watson.
Fall Pippin: 1st, J. B. Gutthrey; 2nd, Wm. Clements.
Fameuse: 1st, W. G. Watson; 2nd, J. B. Gutthrey.
Golden Russet: 1st, W. G. Watson; 2nd, J. B. Gutthrey.
Greening: 1st, John Frank, The Grange; 2nd, Geo. Wilson, Churchville.
King: 1st, W. G. Watson; 2nd, Wm. Clements, Clarkson.
Spy: 1st, J. B. Gutthrey; 2nd, W. G. Watson.
Ontario: 1st, W. G. Watson; 2nd, J. B. Gutthrey.
Wealthy: 1st, W. G. Watson; 2nd, J. B. Gutthrey.

PRINCE EDWARD:
Baldwin: 1st, Frank Dempsey; 2nd, Harry Dempsey.
Cranberry: 1st, Harry Dempsey; 2nd, Frank Dempsey.
Fameuse: 1st, Frank Dempsey; 2nd, Harry Dempsey.
Gano: 1st, Harry Dempsey; 2nd, Frank Dempsey.
Golden Russet: 1st, Frank Dempsey; 2nd, Harry Dempsey.
Greening: 1st, Harry Dempsey; 2nd, Frank Dempsey.
McIntosh: 1st, Harry Dempsey; 2nd, Frank Dempsey.
Spy: 1st, Frank Dempsey; 2nd, Harry Dempsey.
Stark: 1st, Frank Dempsey; 2nd, Harry Dempsey.

EAST SIMCOE:
Alexander: 1st, G. C. Caston.
Baxter: 1st, G. C. Caston.
Fameuse: 1st, W. T. Lee, Orillia; 2nd, W. Forrester, Rugby.
Golden Russet: 1st, W. A. Forrester; 2nd, R. A. Lehmann.
McIntosh: 1st, W. T. Lee; 2nd, Harry Wood, Ardtrea.
Spy: 1st, C. L. Stephens.
Wealthy: 1st, W. Forrester; 2nd, Robt. Street, Orillia.
Wolfe: 1st, Wm. Bacon, Orillia; 2nd, Harry Wood, Ardtrea.
Any other variety: 1st, J. H. Overend, Warminster; 2nd, W. T. Lee.

STORMONT, DUNDAS AND GLENGARRY:
Alexander: 1st, Jno. D. McDonald, Cornwall; 2nd, Ernest McDonald, Cornwall
Baxter: 1st, Jno. D. McDonald; 2nd, Jno. D. Campbell, Cornwall.
Fameuse: 1st, Jno. D. McDonald; 2nd, Nicholas Everetts, Iroquois.
Golden Russet: 1st, N. Everett; 2nd, E. McDonald.
McIntosh: 1st, N. Everetts; 2nd, Jno. D. McDonald.
Greening: 1st, Jno. A. McDonell.
Scott Winter: 1st, Jno. D. Campbell; 2nd, Jno. D. McDonald.
Wealthy: 1st, Jno. D. Campbell; 2nd, Jno. D. McDonald.
Wolfe: 1st, E. McDonald; 2nd, Jno. D. McDonald.
Any other Variety: 1st, A. D. Harkness; 2nd, A. D. Harkness.

VICTORIA:
Alexander: 1st, W. M. Robson, Lindsay.
Fameuse: 1st, W. M. Robson. 2nd, Bowen Bros. Valentia.
Greening: 1st, Bowen Bros.
King: 1st, J. O. Swain, Valentia. 2nd, Bowen Bros.
McIntosh: 1st, R. E. Thurston; 2nd, W. M. Robson.
Golden Russet: 1st, J. O. Swain; 2nd, Bowen Bros.
Spy: 1st, J. O. Swain; 2nd, Jno. Beecroft. Sonya.
Wealthy: 1st, E. L. Thurston, Bobcaygeon; 2nd, Jno. Beecroft.
Yellow Bellefleur: 1st, J. O. Swain; 2nd, W. M. Robson.
Any other variety: 1st, J. O. Swain; 2nd, J. O. Swain.

WENTWORTH:
Baldwin: 1st, Franklin Baker, Waterdown. 2nd. J. Tregunno & Sons, Bartonville
Ben Davis: 1st, J. Tregunno & Sons. 2nd, Franklin Baker.
Blenheim: 1st, Franklin Baker; 2nd, J. J. Green, Waterdown.
Cranberry Pippin: 1st, Franklin Baker; 2nd, J. J. Green.
Golden Russet: 1st, Murle Ryckman; 2nd, J. J. Green.
Greening: 1st, J. Tregunno & Son; 2nd, J. J. Green.
Hubbardston: 1st, J. Tregunno & Sons; 2nd, Franklin Baker.
King: 1st, Franklin Baker. 2nd, J. Tregunno & Sons.
Spy: 1st, J. Tregunno & Sons; 2nd, Franklin Baker.
Snow: 1st J. Tregunno & Sons; 2nd, Murle Ryckman.

YORK.
Alexander: 1st, J. G. Brown Humber Bay; 2nd, Luke Gibbons.
Blenheim: 1st, A. R. Davison; 2nd, J. G. Brown.
Fameuse: 1st, R.W. Thomson, Ellesmere; 2nd, W. H. Stone, Bond Head
Golden Russet: 1st R. W. Thompson; 2nd, Chas. Plunkett.
Greening: 1st, W. H. Stone; 2nd, N. Brown.
King: 1st, A. R. Davison; 2nd, J. B. Lawrie.
Spy: 1st, R. W. Thomson; 2nd, W. H. Stone.
St. Lawrence: 1st, Chas. Plunkett; 2nd, J. G. Brown.

CONSTITUTION AND BY-LAWS.

REVISED CONSTITUTION AND BY-LAWS OF THE FRUIT GROWERS' ASSOCIATION OF ONTARIO.

Preamble.

The objects of the Fruit Growers' Association of Ontario shall be the advancement of the science and art of horticulture in all its branches.

(*a*) By holding an Annual Convention for the consideration of questions relating thereto.

(*b*) By co-operating in every possible way with district and local fruit growers' associations and horticultural societies hereinafter mentioned.

(*c*) By collecting, arranging and disseminating useful information.

(*d*) By co-operating with the Ontario Department of Agriculture in all matters pertaining to the advancement of horticulture.

(*e*) By holding an annual exhibition of fruit and other horticultural products and awarding premiums in connection with the same.

(*f*) And by such other means as may from time to time seem desirable.

Name.

1. This Association shall be called the Fruit Growers' Association of Ontario, and hereafter in this Constitution shall be referred to as the Ontario Association.

Membership.

2. Any person interested in horticulture may become a member by payment of one dollar per annum in advance to the general secretary, or by paying the necessary fee to the secretary of any district or local association in affiliation with the Ontario Association. A single payment of $10.00 to the general secretary shall constitute a member for life.

3. Members of the Ontario Association in good standing shall be entitled to receive regularly the official organ of the Association, a copy of the Annual Report, such other literature as may be sent out by the Association from time to time and any other privileges that may be provided or arranged for by the Association.

4. The Association financial year shall end on the 31st of December.

Annual Meeting.

5. The Annual Meeting shall be held at such time and place as may be designated by the Ontario Association.

Officers.

6. A President, Vice-President, Secretary-Treasurer and Directors only shall be the duly qualified officers of the Ontario Association.

7. The Directors shall be elected by ballot at the morning session of the last day of the Annual Meeting, and shall be thirteen in number, representing the thirteen Horticultural Divisions as set forth in Schedule A of this Constitution. The newly elected Board of Directors shall not take office till the second Tuesday in January of the year following, when the report of the retiring Executive and the Treasurer shall be received. Those four Directors who have occupied positions on the Board of Directors for the longest period shall not be eligible for re-election. These Directors shall, however, be eligible for re-election at the end of one year.

8. The newly elected Directors shall at their first meeting appoint from among their number a President and a Vice-President, and also from among themselves or otherwise, a Secretary-Treasurer.

9. The President, Vice President, Secretary-Treasurer and two other members appointed by the Directors shall constitute the Executive Committee of the Ontario Association.

Duties of Officers.

10. It shall be the duty of the President to preside at all meetings of the Ontario Association, decide all questions of order, and make any suggestions he may deem

necessary in the interests of the Association. He shall be, *ex-officio*, a member of all committees appointed.

11. In the absence of the President, the powers and duties of his office shall devolve upon the Vice-President.

12. It shall be the duty of the Secretary-Treasurer to attend all meetings of the Ontario Association, the officers and the Executive, and keep correct minutes of the same; conduct all correspondence and issue all press and other reports; prepare the report of the Executive Committee for the Annual Meeting; forward the list of representatives to the Secretaries of Fair Associations, also prepare for publication the Annual Report. As Treasurer, he shall receive and account for all moneys belonging to the Association, pay such bills and accounts as have been approved by the Executive. He shall have the power of Managing Director acting under the control and with the approval of the Executive.

13. By virtue of his office he shall be a member of each committee appointed.

14. Before entering upon the duties of his office, he shall enter into a bond, with security when required, which shall be approved of by the Directors.

15. The accounts of the Ontario Association shall be audited by an expert auditor or accountant appointed by the Executive Committee, and approved by the Minister of Agriculture for Ontario.

16. At each Annual Meeting, the retiring executive officers shall present a full report of their proceedings to the Ontario Association. A detailed statement of the receipts and expenditures for the previous year, and of assets and liabilities, a list of members and such information on matters of special interest to this Association as the officers may have been able to obtain, shall be sent to the Minister of Agriculture for Ontario within forty days after the holding of such Annual Meeting.

17. The Executive Committee shall carry into effect the plan of work decided upon by the officers, and shall arrange the details of the same.

18. The officers, or the members of the Executive, or of any Committee may conduct by correspondence, the duties assigned to said officers, Executive or Committee, by the Constitution and By-laws, or by the Association, when such a course is deemed advisable by said officers, Executive or Committee.

19. In case a vacancy occurs in the officers or directorate, the Executive Committee may fill said vacancy forthwith.

Committees.

20. The Association may appoint such committees from time to time as may be deemed expedient, and the first person named thereon shall be declared chairman of each committee.

21.—(*a*) The actual and reasonable expenses of officers and members of committees when attending meetings in the interests of the Association shall be defrayed out of the funds of the Association.

(*b*) The railway fare only of the Directors in attending the Annual Meeting shall be paid by the Ontario Association.

Notice of Meeting.

22.—(*a*) At least two weeks' notice shall be given of each annual and general meeting, naming time and place of meeting. Notice may be given through the public press and by circular letter mailed to each member.

(*b*) An officers' meeting shall be called by mailing at least ten days before date of meeting to each officer, a notice of meeting as above provided.

(*c*) Similar notice shall be given to each member of the Executive before an Executive meeting is held.

(*d*) An Executive meeting may be held on shorter notice, provided each officer is otherwise notified and consents thereto.

Quorum.

23.—(*a*) Not less than ten members shall be a quorum to transact business for the Association; not less than five members shall be a quorum at an officers' meeting; and not less than three members shall be a quorum at an Executive meeting.

(*b*) Any member of the Directorate or Executive not present at a meeting, if he send his views in writing, shall be considered as present.

Affiliated Associations.

24. Fruit Growers in any section of Ontario may form a local Association when it has a membership of ten or over, upon the payment to the Treasurer of the Ontario

Association of $5.00 for the first twenty-five members or fraction thereof above nine, and twenty-five cents per member for every additional member, which payment shall entitle the members to all the privileges and advantages of membership in the Ontario Association.

25. It shall be the duty of the officers and directors of the Ontario Association to encourage the formation of such local Associations.

26. Fruit Growers who are members of two or more local Associations shall be accepted as members of the Ontario Association from that affiliated Association only which is the first to forward the membership fee to the Secretary-Treasurer of the Ontario Association.

27. Such affiliated Associations may appoint one delegate to the Annual Meeting of the Ontario Association for the first twenty-five members or fraction thereof, and an additional delegate for every twenty-five members or major portion thereof above the first twenty-five. The actual railway fare of said delegate in attending the Annual Meeting shall be paid by the Ontario Association.

Change of Constitution.

28. This constitution and by-laws may be amended by a majority of members present at an Annual Meeting or a special meeting called for the purpose of considering the same, and of which two weeks' notice shall be given.

Schedule A.—Horticultural Divisions.

1. Counties of Renfrew, Lanark, Carleton, Russell and Prescott.
2. Counties of Glengarry, Stormont, Dundas, Grenville, Leeds and Frontenac.
3. Counties of Lennox and Addington, Hastings and Prince Edward.
4. Counties of Northumberland, Durham, Peterboro' and Victoria.
5. Counties of Ontario and York
6. Counties of Peel and Halton.
7. County of Wentworth.
8. County of Lincoln.
9. Counties of Welland, Haldimand, Norfolk and Elgin.
10. Counties of Kent, Essex, and Lambton.
11. Counties of Middlesex, Huron and Bruce.
12. Counties of Brant, Oxford, Perth, Waterloo, Wellington and Dufferin.
13. Counties of Grey, Simcoe, Muskoka, Parry Sound, Nipissing, Algoma and Manitoulin.

Fourteenth Annual Report

OF THE

Fruit Experiment Stations

of Ontario

UNDER THE JOINT CONTROL OF

THE ONTARIO AGRICULTURAL COLLEGE, GUELPH

AND

THE FRUIT GROWERS' ASSOCIATION OF ONTARIO

1907

PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
TORONTO, 1908.

WARWICK BRO'S & RUTTER, Limited, Printers
TORONTO.

To the Honorable SIR WILLIAM MORTIMER CLARK, K.C.,
Lieutenant-Governor of the Province of Ontario.

MAY IT PLEASE YOUR HONOR:

I have the pleasure to present herewith for the consideration of your Honor the Report of the Fruit Experiment Stations for 1907.

Respectfully yours,

NELSON MONTEITH,
Minister of Agriculture.

TORONTO, 1908.

FRUIT EXPERIMENT STATIONS.

BOARD OF CONTROL.

G. C. Creelman, B.S.A., President of the Ontario Agricultural College, Chairman ..... Guelph.
H. L. Hutt, Professor of Horticulture ..... Guelph.
W. T. Macoun, Horticulturist at Central Experimental Farm ..... Ottawa.
A. M. Smith, Director of Ontario Fruit Growers' Association ..... Port Dalhousie.
G. A. Robertson, Director of Ontario Fruit Growers' Association ..... St. Catharines.
P. W. Hodgetts, Secretary of Ontario Fruit Growers' Association ..... Toronto.
Linus Woolverton, M.A., Secretary ..... Grimsby.

EXECUTIVE COMMITTEE.

G. C. Creelman ..... Chairman.
L. Woolverton, Prof. H. L. Hutt ..... Inspectors.
P. W. Hodgetts ..... Secretary O. F. G. A.

THE ONTARIO FRUIT EXPERIMENT STATIONS.

	Name.	*Speciaity.*	*Experimenter.*
1.	Southwestern	Peaches	J. L. Hilborn, Leamington.
2.	Essex	Vegetables	E. E. Adams, Leamington.
3.	Wentworth	Grapes	Murray Pettit, Winona.
4.	Burlington	Blackberries and Currants	A. W. Peart, Burlington.
5.	Lake Huron	Raspberries, Gooseberries and Plums	A. E. Sherrington, Walkerton.
6.	Simcoe	Hardy Apples and Hardy Cherries	G. C. Caston, Craighurst.
7.	Bay of Quinte	Apples	W. H. Dempsey, Trenton.
8.	St. Lawrence	Hardy Plums and Hardy Pears	Harold Jones, Maitland.
9.	Algoma	Hardy Fruits	Chas. Young, Richard's Landing.
10.	Maplehurst	General Collection of Cherries, Peaches, Grapes and Pears for comparative study	The Secretary.

CO-OPERATIVE WORK.

Strawberries ..... Rev. E. B. Stevenson, 270 Grange Street, Guelph.
Vegetables and Strawberries ..... Prof. H. L. Hutt, O.A.C., Guelph.
Hardy Fruits ..... W. T. Macoun, C.E.F., Ottawa.
" ..... C. Chapman, Judge, Ont.

Fruit Experiment Stations, 1907.

THE SECRETARY'S REPORT.

By Linus Woolverton, Grimsby.

In accordance with the instructions of the Board of Control, some special varieties of fruits were sent out to the Fruit Stations for testing:—

Varieties Ordered for Stations.

Apples: From Mr. W. T. Macoun, Horticulturist of the Central Experimental Farm, the following varieties of apples were sent to Chas Young, Algoma Station, at Richard's Landing: Forest, Okabena, Adonis, Crusoe, Galetta, Mendel, Navan, Noel, Ottawa. Of these Mr. Macoun says: The last seven varieties mentioned are our own seedlings, all of which are quite promising.

Currants: With the object of testing the suitability of currants as a commercial crop in certain sections, the following collection was ordered from Mr. Joseph Tweddle, Fruitland, to be sent to G. C. Caston, Simcoe Station, Craighurst; C. Chapman, Co-operative Experimenter in Temiskaming District, Judge, Ont.; Chas. Young, Algoma Station, Richard's Landing; H. Jones, St. Lawrence Station, Maitland, and J. L. Hilborn, Southwestern Station, Leamington, Ont., viz:—

20 Black Victoria, 20 Naples, 20 Champion, 15 Fays, 5 Cherry, 5 Wilder, 5 Chautauqua, 5 Versailles, 5 White Grape.

Strawberries: There was also sent them the following collections of 1,000 plants of strawberries from E. B. Stevenson, Guelph, for the purpose of giving them a fair commercial test, viz.:—

Splendid, Senator Dunlop, Tennessee Prolific, Three W's, Cardinal, Sample, Ruby, Fountain.

To C. Chapman, Judge, Ont., near New Liskeard, the following collection of hardy stock was ordered from E. D. Smith, Nurseryman, Winona, viz.:—

Apples: Alexander, Astrachan, Charlamoff, Duchess, Hibernal, Hyslop, Longfield, Martha, Patten's Greening, Scott, Wealthy, Wolf, Transparent.

Blackberries: Agawam, El Dorado, Snyder.

Cherries: Montmorency, Orel, Richmond.

Gooseberries: Downing, Pearl, Red Jacket.

Grapes: Brighton, Champion, Diamond, Moore, Moyer.

Pears: Flemish Beauty.

Plums: Burbank, De Soto, Forest Rose, Hammer, Hawkeye, Milton, Whittaker.

Raspberries: Conrath, Herbert, Hilborn, Marlboro, Shaffer.

To all the Fruit Stations, twelve each of the Herbert raspberry and two each of the Spencer Seedless Apples were also ordered.

For the purpose of carrying out a special experiment in the County of Essex of growing peach trees on plum-roots for hardiness to prevent root killing by frost, 500 Myrobalan, 500 Americana, and seedling plum stocks were ordered from the Shenandoah Nurseries in Iowa. Mr. A. M. Smith, an experienced nurseryman, was engaged to bud these seedlings for the

Board to the leading varieties of peaches. Two or three hundred were large enough for receiving buds, and the balance will need to be carried over for another season.

New Ontario.

The outlook for the success of tree fruits in New Ontario is not very encouraging, as appears from the following extract from Mr. Chapman's letter of May 28th, 1907: "The trees received last year looked well in April, but the cold and snow during the fore part of May seemed to hurt them. I will report later how they stood the winter. The mercury went down to 55 degrees below zero last winter, and if they come out all right I think they will stand anything." On July 16th he writes: "I am very sorry to say that the frost killed all the apple trees I planted last year, except one tree, and I have only three plum trees out of the dozen that are alive."

The Fruit Station Exhibit at Massey Hall.

At a meeting of our Board of Control in December, 1905, it was resolved "that in the opinion of the Board it is highly desirable that the Fruit Experiment Stations of Ontario, the Ontario Agricultural College, and the Central Experimental Farm make their special educative exhibits in conjunction at the Fruit, Flower and Honey Show, and therefore we hereby petition the Management of the said Show to provide in one room and side by side such space as may be desired by the said institution for such educative exhibits. We estimate that not less than 700 square feet of table room will be required."

Unfortunately, at both the exhibitions following, viz., in November, 1906, and in November, 1907, this request of the Board could not be granted owing to lack of space. At the latter, five of our stations, the Central Experimental Farm, and the Women's Institute had their space in conjunction, upstairs; but four of our stations were crowded into a side table in the basement, with scarcely space to keep the varieties separate, let alone show them to advantage; while the interesting Agricultural College exhibit was placed in another part of the hall entirely. No doubt we shall in time have a commodious horticultural building in Toronto, in which case the wishes of our Board will be complied with, viz., to make these exhibits under the auspices of the Department of Agriculture of that real educational value which was intended.

Speaking of our Fruit Stations in the order of their exhibits we had the following on the main floor:

Burlington Station.

Mr. A. W. Peart showed the following list of varieties:

Southern varieties, of Apples, which have borne only two crops and are not yet sufficiently tested to be divided into desirable and undesirable: Black Ben Davis, Blue Pearmain, Bonum, Belmont, Carter's Blue, Cullasaga, Gill's Beauty, Gilbert, Housley's Winesap, Highfile, Huntsman, Kentucky Tolenstein, L. S. Pearmain, Little's Red Winter, Milam, Minnesota Pippin, Malinda, Nickajack, Ozark, Penn Red Streak, Red Limbertwig, Rebel, Swaar, Wandering Spy.

Apples desirable: Blenheim Pippin, Seek No Further, Baldwin, Greening, King, N. Spy, Ribston Pippin, Cranberry.

Apples not desirable: Holland Pippin, Golden Russet, Pewaukee, Roxbury Russet, Snow, Ontario.

Pears desirable: Anjou, Clairgeau, Duchess, Josephine, Keiffer, Winter Nelis.

Cherries desirable: May Duke, Windsor, Early Richmond, Montmorency, English Morello, Common red.

Requiring further test: Napoleon, Louis Phillipe.

Pears desirable: Giffard, Wilder.

Plums desirable: Bradshaw, Glass Seedling, H. R. Purple Egg, Abundance, Burbank, Red June.

Requiring further test: Prince of Wales, America, Chabot, Willard, Wickson.

Currants desirable: Cherry, Fay, North Star, Prince Albert, Victoria Wilder. Black: Collins Prolific, Naples, Saunders, Lee. White: Grape and Imperial.

Not desirable: Belle de St. Giles, Brayley, Crandall, Raby Castle, Red Dutch.

Requiring further test: Baldwin, Beauty, Boskop's Giant, Comet, Perfection, Pomona, Red Cross, Standard, Success, Versailles, Black Victoria.

One jar variegated tomatoes.

One jar fruit of Mulberry.

An extra jar of Montmorency Cherries.

Note: The above lists of fruits desirable are in the nature of things only partial. For example, Bartlett Pears and Lombard Plums were not shown in the bottles. For complete lists of desirable fruits, see Station report, 1907.

Mr. Peart's bottled fruits were beautifully preserved by the use of one-half per cent. of formalin in water. One bottle of Montmorency cherries, containing a branch about ten inches long laden with 35 fine large specimens, was worthy of especial notice.

As with all our exhibits, specially recommended commercial varieties of apples were shown in pyramids in order to attract the eye, while less important kinds were shown in plates. The fruits from top grafted scions of some two dozen Southern varieties of apples shown by Mr. Peart were very inferior to the varieties we grow in Ontario, going to show that varieties which succeed best in one latitude are not always equally desirable in another.

Lake Huron Station.

Mr. A. E. Sherrington showed the following varieties:—

Apples: Astrachan, American Pippin, Baldwin, Ben Davis, Canada Baldwin, Fameuse, Greening, Gravenstein, Grime's Golden, Hulbert, Hyslop, King, La Victoire, McIntosh, Mann, NorthWestern Greening, Ontario, Peter, Pewaukee, Russet, Ribston, Scarlet Pippin, Spy, Spencer, Seek, Stark, Salome, Spitzenburg, Tolman, Transcendent, Wine-Sap, Wealthy, Yellow Transparent, Yellow Harvest.

Plums: Abundance, American, Arch Duke, Burbank, Bradshaw, Coe, Duanes' Purple, Field, Gueii, Giant Prune, Imperial Gage, Lombard, Lincoln, Monarch, Moore's Arctic, McLaughlin, Niagara, Ogon, Englebert, Pond's Seedling, Purple Egg, Quackenboss, Red June, Shipper's Pride, Smith's Orleans, Spaulding, Saunders, Victoria Yellow Egg, Seedling.

Cherries: Dyehouse, English Morello, Early Richmond, Empress Eugenie, Late Duke, Montmorency, Olivet, Ostheim, Wragg, Yellow Spanish.

Pears: Citron de Carmes, Clairgeau, Goodale, Louise Nouvelle Fulvie.

Raspberries: Cuthbert, Conrath, Golden Queen, Hilborn, Herbert, Turner.

Blackberries: Agawam, Eldorado, Gainor, Lucretia.

Currants: Champion, Cherry, North Star, Naples, Prince Albert, Perfection, Pomona, Red Cross, Raby Castle, Saunders, Versailles, Victoria, Wilder, White Grape, White Imperial.

Gooseberries: Crown Bob, Champion, Downing, Industry, Keepsake, Pearl, Red Jacket, Whitesmith.

Strawberries: Brandywine, Matilda, Michels, Saunders, Smith No. 1, Strawberry-Raspberry.

He showed three baskets of apples neatly packed for shipment, viz., Snow, Scarlet Pippin, and Peter. The latter, he claims, does not drop quite so badly as the Wealthy, which it much resembles. He showed the Perfection Currant in his large collection of bottled summer fruits; this variety cost $3 for six plants, but one year's trial shows no superiority to warrant the extravagant title.

Simcoe Station.

Mr. G. C. Caston showed six pyramids, being samples of what he considered the best commercial varieties of apples for his district, as follows:—

Desirable Commercial Apples: Baxter, Fallawater, Golden Russet, King, Peerless and Snow.

All these were creditable samples, and were much studied by visitors. He also showed as desirable Spy, Baldwin, Greening, McIntosh, Scarlet Pippin, Gano, Seek, Canada Red, Canada Baldwin, Steele's Red, Wolf, Alexander, St. Lawrence, Ontario and Princess Louise.

Not Desirable: Gideon, Cooper's Market, Arabka, Fanny, Aiken's Red, Hamilton and Clayton.

His Peerless again deserves special notice, for it is as attractive as the Duchess, later in season, and very uniform in size and grade, tree run. This variety might well be tested everywhere. His Baxters were large and highly colored, and Mr. Caston claims that this apple is profitable for the colder sections. His Fallawaters were also worthy of especial mention. The Scarlet Pippins too are remarkably well grown by Mr. Caston, for scions procured by him from the St. Lawrence Station, the home of the variety, bore fruit this season with which Mr. Caston took a first prize over Mr. Jones.

Wentworth Station.

Mr. M. Pettit showed the following list of varieties:—

Grapes Desirable: Agawam, Campbell, Champion, Delaware, Lindley, Moore's Diamond, Niagara, Worden, Vergennes.

Valuable: Brighton, Dr. Collier, Diana, Early Victor, Eumelan, Isabella, Moore's Early, Massasoit, Pocklington, Requa, Roger 43, Roger 44, Salem, Wyoming Red.

Not Desirable: Anderson, America, August Giant, Amber Queen, Aminia, Arnold, Alvey, Alice, Black Delaware, Black Pearl, Bacchus, Belle, Beacon, Brockman, Brilliant, Beauty, Golden Drop, Goethe, Green Mountain, Green's Golden, Gærtner, Geneva, Highland, Hermann, Hayes, Janesville, Jessica, Kensington, Creveling, Croton, Cottage, Cynthiana, Canada, Duchess, Dracut Amber, Empire State, Early Dawn, Elvira,

El Dorado, Eaton, Esther, Etta, Eumelan, Elicand, Marion, Maxatawny, Moyer, Mason Seedling, Martha, Montgomery Northern Light, Noah, Olitie, Oriental, Oneida, Poughkeepsie Red, Lady Washington, Lutie, Lady, Mills, Watt, Woodruff Red, Black July, Black Pearl, Clinton, Perkins, Prentiss, Rockwood, Rommel, Roger 13, Roger 7, Roger 41, Rebecca, Transparent, Triumph, Ulster Prolific.

This was a very creditable collection, and occupied a table 18 ft. long and all arranged in good taste. A few kinds, such as Goethe, must have necessarily been ringed in order to have them so well ripened in such an unfavorable season; indeed, there are several varieties which are really improved for our climate by judicious ringing. Good samples were shown of Kensington, one of Dr. Saunders' Seedling. We could see very little difference between his Alice and his Diana, although the former is being sold as a new and distinct variety. He showed Early Victor, a very early sweet black grape, quite productive and possibly a very early salable market variety. His Lindley's were exceptionally fine in bunch; indeed if such samples could be grown every season, it would be our most popular red, market grape. It is excellent in flavor, early in ripening and large in berry. His Requa were very fine, and also his Campbell.

Algoma Station.

Mr. Chas Young sent down a box containig the following varieties, which we placed on the table and duly labelled:—

Apples: Alexander, Astrachan, Basil the Great, Canada Red, Charlamoff, Colvert, Duchess, Gideon, Hyslop. Isham, Louise, Longfield, Martha, McIntosh, North Star, Oriel, Peter, Peach, Snow, St. Lawrence, Switzer, Scott's Winter, Tolman, Walbridge, Wolf River.

He writes that he is planting and top grafting thirty other varieties for comparison, and claims that the number of kinds in bearing orchard in Algoma is no hindrance to Commercial success, for any apples that will fill an eleven quart basket sell readily in nearby markets.

St. Lawrence Station.

Mr. Harold Jones placed on the tables from his station five pyramids of desirable commercial apples and thirty-one varieties of apples not specially recommended for his district as follows:—

Apples (in pyramids) *Desirable*: Baxter, Fameuse, McIntosh, Milwaukee and Scarlet Pippin.

Not Valuable in St. Lawrence District: Aiken's Red, Blunt, Bellflower, Boiken, Canada Red, Downing, Excelsior, Golden Russet, Hamilton, Hurlburt, Gano, McMahon, Mammoth Black Twig, Magog, Milding, N. W. Greening, Pomme Grise, Plumb's Cider, Parlin's Beauty, Pewaukee, Rome Beauty, Roman Stem, Salome, Shiawassie, Scarlet Pippin, Scott, Shackleford, Tolman, Wismer, Winesap, Wealthy.

The Bay of Quinte Station.

Mr. W. H. Dempsey showed the following extended list of varieties:—

Desirable: Alexander, Banana, Blenheim, Baldwin, Ben Davis, Coo's River Beauty, Cranberry, Carolina Beauty, Downing, Fallawater, Fameuse, Greening, Golden Russet, McIntosh Red, Madoc, Nonsuch, Ontario, Rox

Russet, Ribston Pippin, Rome Beauty, Scarlet Pippin, Stark, Saxon, Seek, Shiawassee, Spy, Trenton, Wealthy, Walter, Wolf River, Windsor Chief, York Imperial.

Not Desirable: Autonovka, Bailey Sweet, Bellflower, Bismark, Cabashea, Cooper's Market, Gano, Golden Ball, Golden White Kentish Fillbasket, Landsburger, Longfield, Lord Burleigh, Minkler, Milding, Mammoth Pippin, Maggie's Favorite, Pewaukee, Sutton's Beauty, Scott's Winter, Vermont Sweet, Winesap.

Essex Vegetable Station.

Mr. E. E. Adams, who has only begun work in experimentation of vegetables, made a fairly good exhibit, considering the unfavorable conditions. The following are the varieties shown:—

Desirable.

Water Melon—Halbert Honey.

Musk Melons—Rocky Ford, Long Island Beauty, Unsworth's Perfect, Burrell's Gem, Osage, Ideal the Grand, Model.

Lettuce for forcing under glass—Grand Rapids.

Red Peppers—Long Cardinal, Long Cayenne.

Green Peppers—Chinese Giant, Neapolitan Early.

Onions—Prizetaker, Yellow Globe Danvers, Large Red Wethersfield.

Celery—Paris Golden, White Plume.

Sweet Potatoes—Jersey Sweets.

Tomatoes—Earliana, Plentiful, Stone, Royal Red, Chalk's Early Jewel, Atlantic Prize.

Citron—Colorado Giant.

Not Desirable.

Sweet Potatoes—Yellow Nansemond, Virginia Sweets, Vineless.

Tomatoes—Early Michigan, Livingston's New Globe, Matchless Swedesboro, Moore's King of the Earlies.

Musk Melons—Early Hackensack, Tip Top, Grand Rapids, Early Ripe, Champion Market.

Celery—Triumph.

Peppers—Procapp's Giant, very rough and ill-shaped.

Cost of the Fruit Stations, 1907.

Considering the extent of the work acomplished by the ten stations in operation during the year 1907, with about fifty acres in all devoted to testing varieties, the whole cost is very small. The Secretary's memoranda of expenditure for the year are as follows: Experimenters, $1,712.50; Inspector, $100; Secretary, $300; Board meetings, $112.44; fruit exhibits, $345.84; stock for stations, $226.91; freight, express and duty, $21.86; postage, $10; photos of fruit, $2.10; copying report (5 copies), $11; total $2,842.65.

Extent of the Work.

The following tabular statement gives an approximate idea of the number of acres occupied by our stations in experimental work, the number of

varieties that have been under test, and the special fruits to which each experimenter has been asked to devote especial attention:

Name of Station.	Name of experimenter.	No. of varieties	No. of acres.	Specialties.
Wentworth	M. Pettit	200	3	Grapes
Bay of Quinte	W. H. Dempsey	200	5	Apples
Southwestern (fruit)	J. L. Hilborn	100	5	Peaches
(vegetables)	E. E. Adams	100	2	Vegetables
Burlington	A. W. Peart	300	2½	Currants and Blackberries Commercial Pears
Lake Huron	A. E. Sherrington	200	4	Raspberries and Gooseberries
Georgian Bay	John Mitchell	300	5	Plums
Simcoe	G. C. Caston	220	5	Hardy Plums Hardy Cherries
St. Lawrence	H. Jones	200	5	Hardy Plums Hardy Pears
Maplehurst	L. Woolverton	700	10	General collection
Strawberry Station	E. B. Stevenson	150	1	Strawberries
Algoma	Chas. Young	200	4	Hardy Fruits
New Ontario	C. Chapman	100	.....	Hardy Fruits
		2,970	51½	

THE ANNUAL MEETING.

The annual meeting of the Board of Control was held at the Parliament Buildings, Toronto, on Monday 13th January, 1908, at 11 o'clock a.m. There were present G. C. Creelman, P. W. Hodgetts, Prof. H. L. Hutt, W. T. Macoun, A. M. Smith, G. A. Robertson, and Linus Woolverton.

The minutes of the last meeting were read and approved. Correspondence was read by the Secretary from E. E. Adams, Leamington, accepting his appointment as experimenter in vegetables for the Lake Erie district, and proposing plans for increasing the interest in his vegetable exhibit at Massey Hall, in 1908: also from J. L. Hilborn accepting his appointment as experimenter in fruits for the Lake Erie district; from Mr. C. C. James, Deputy Minister of Agriculture, regarding the proposed change in the name on our report to cover vegetables as well as fruits; from W. H. Dempsey, Trenton, resigning his position as experimenter in apples for the Bay of Quinte district; and from the Hon. Nelson Monteith, to the effect that the work of this Board would in future be combined with that of the Advisory Board of the Jordan Horticultural Station. The following is a copy of the letter:

Toronto, Jan. 7th. 1908.

Mr. L. Woolverton *Secretary of the Board of Control.*

Dear Sir,—I should be glad if, at the forthcoming meeting of the Board of Control of the Fruit Experiment Stations, you would kindly intimate to the Board my decision in regard to the direction of these stations for the future.

Now that an Advisory Board is to be appointed to assist the Department in the management of the station at Jordan, it is felt that this Board might very properly undertake a similar duty in regard to the local stations. It has, therefore, been decided to turn over to that Board the duties hitherto performed by the Board of Control.

Through the establishment of the Fruit Experiment Stations, valuable data has been ascertained and given to the public regarding the adaptability of the better known varieties of fruits to the various sections of the Province. So far as the future is concerned, it would seem that any further work these stations may undertake must be in conjunction with that performed by the Farm or station at Jordan, which makes it desirable that the one Board should advise in connection with both.

As this will be the last meeting of your Board, I desire to express my warm appreciation of the work performed in the interest of fruit growing in this Province, by those who have served on it in the past.

Yours very truly,

NELSON MONTEITH,
Minister of Agriculture.

Ordered that the Secretary send to the Hon. Nelson Monteith a copy of the following resolution now passed by this Board.

"We the members of the Board of Control of the Ontario Fruit experiment stations, assembled at this our last annual meeting, wish to put ourselves on record as highly appreciating the active interest and valuable assistance given our work by the Ontario Department of Agriculture; and we hope they will continue in the future to bestow the same if not greater attention to this work, which is of constantly increasing importance to the Province."

Ordered that the Secretary include in the Annual Report the following resolutions now passed by this Board:—

MR. DEMPSEY'S RETIREMENT.

"Whereas the Board of Control of the Ontario Fruit Experiment Stations has received and accepted with regret the resignation of Mr. W. H. Dempsey, as experimenter in apples, in Eastern Ontario, this Board hereby records its high appreciation of Mr. Dempsey's valuable services to the fruit growers, not only of his own district but also of all parts of the Province; and desire to express to him our thanks for the self-sacrifice and interest which he has shown in this work during the past ten years."

THE EXPERIMENTERS.

At this, the last meeting of the Board of Control of the Ontario Fruit Stations, the members of the Board desire to place on record their appreciation of the friendly relations which have existed during the past ten years between the experimenters and this Board; and, in retiring, wish the fruit experimenters of the Province of Ontario a long and successful career of usefulness.

FUMIGATION.

In view of the fact that many fruit growers still believe that the fumigation of nursery stock causes more or less injury to it, and hence means a loss to them, be it resolved that it is most desirable that experiments be conducted at the Jordan Harbor experimental farm, in co-operation if necessary with the Dominion Government agents at the borders, to determine definitely if such injury really does occur; these experiments to be conducted with both tree and bush fruits.

BEES AND FRUIT.

Resolved that in view of the apparent evidence shown during the fruit season of 1907 of the importance of honey bees in insuring the pollination of

the blossoms, and the setting of the fruit, we would recommend that systematic experiments be undertaken by the new Advisory Board to determine definitely the value of honey bees in this particular, in order that their usefulness may be brought more prominently under the notice of the fruit growers of the country.

APPLES OF CANADIAN ORIGIN EXHIBITED BY THE CENTRAL EXPERIMENTAL FARM, OTTAWA, AT THE FRUIT, FLOWER AND HONEY SHOW, TORONTO, NOVEMBER, 1907.

By W. T. Macoun, Dominion Horticulturist, Ottawa.

An interesting collection of fruit was exhibited by the Central Experimental Farm, Ottawa, at the Fruit, Flower, and Honey Show held in Toronto, November, 1907. One hundred varieties of apples were shown, most of which were new or little known kinds, including 36 seedling and cross-bred varieties originated at the Central Experimental Farm. There were sixteen kinds of apples shown in baskets. Eight of these were of Canadian origin, and they were grouped together at one end of the table and placarded as such. These attracted much attention as it was interesting to the general public to know that such fine fruit was originated in Canada.

As the report of the Ontario Fruit Experiment Stations reaches a large number of persons interested in fruit it has been thought desirable to publish descriptions of those which were shown in baskets, so that they may be all found in one place. These descriptions have for the most part been made by the writer before but are brought together here for this special purpose.

Perhaps the most noteworthy of all Canadian apples is the *Fameuse*. While some writers have tried to show that this apple is of French origin and was merely introduced from France by the early Canadian settlers, there is no good evidence to support any such contention; and while there is no positive proof that it is Canadian the evidence is very strong that it was originated somewhere along the St. Lawrence river near Montreal or Quebec early in the seventeenth century. The Fameuse and some of its seedlings stand out prominently among the high class dessert apples of their season, and in addition to their beauty and quality they are very profitable, and if an unprejudiced vote were taken by all fruit growers who are well acquainted with apples on what were the two best dessert varieties of their season—which is November to January in Canada—we believe that the vote would be almost unanimous in favor of the Fameuse and the McIntosh, the latter a Canadian seedling of the former. These two apples are always in great demand in Canada, the United States, and Great Britain, and high prices are usually paid for No. 1 fruit.

The following are descriptions of these fruits:

Fameuse (Snow): Origin unknown. Supposed to have been a seeding originated near Montreal or Quebec early in the seventeenth century. Fruit of medium size, roundish to oblate, skin pale yellow, either almost or completely covered with deep red or splashed and washed with red when fruit is not well coloured; dots not prominent; cavity of medium depth and width; stem short to medium in length, slender or moderately stout; basin small, somewhat narrow, almost smooth; flesh very white, very tender, juicy, subacid with fine flavor and a delicate perfume; core small; quality very good to best; season early winter; tree a strong grower, spreading and

a heavy bearer. This is one of the best dessert apples and one of the most profitable where it succeeds well.

McIntosh: Originated with John McIntosh, Dundela, Ont., early in the nineteenth century. Probably a seedling of Fameuse. Fruit above medium to large roundish, slightly angular, highly perfumed; skin pale yellow, almost entirely covered with crimson, dark on sunny side and brighter on rest of fruit; dots few, small, yellow, distinct, but not prominent; cavity of medium depth and width; stem short, stout; basin narrow, almost smooth, medium depth; calyx partly open; flesh white, crisp, very tender, melting, juicy, subacid, sprightly with pleasant aromatic flavour; core of medium size; quality very good to best; season November to January; tree hardy, and a strong, moderately upright grower and an annual and medium bearer. For its season the McIntosh apple is one of the best varieties grown. It is very subject to spot in some places, but this has not been the experience at the Central Experimenal Farm, where the trees are sprayed. It has also not been found to be a shy bearer as reported by some.

In the Province of Ontario and Quebec are many orchards of Fameuse trees, and in the States in which this variety succeeds it is also very popular and has been largely planted. It is only during the last forty years that the McIntosh apple has been propagated, the son of the originator first beginning this work, and other nurserymen eventually doing the same. The oldest McIntosh orchards are in the vicinity of the original tree, which still remains alive although in bad condition. Naturally there was not much fruit available until comparatively recently, and it is only during the past ten or fifteen years that the fruit has become widely known. So great is the popularity of this variety at present that the nurserymen cannot meet the demand for trees. The McIntosh is superior to the Fameuse in several respects. It is larger, more uniformly handsome, and by most people considered of better quality. It is perhaps not quite so productive as Fameuse, but in our experience is a more regular bearer. Like the Fameuse, it is subject to spot, but this can be prevented by thorough spraying.

Another Canadian apple of the Fameuse group which though not quite as useful as the McIntosh is a very profitable sort on account of its handsome appearance, productiveness and good quality, is the Scarlet Pippin, which is described as follows:—

Scarlet Pippin (Leeds Beauty): Originated at Lyn, Leeds Co., Ontario, near Brockville. Fruit of medium size, oblate to roundish; skin yellow, waxy, more or less washed and splashed with bright and dark crimson, and covered with a light bloom; cavity deep and of medium width; stem short, slender; basin narrow, shallow, almost smooth; calyx generally closed; flesh white, firm, crisp, tender, melting, juicy, a mild subacid, with a pleasant but not high flavour; core small; quality very good; season early winter. A very attractive looking apple and said to sell better than Fameuse, which it does not, however, equal in quality. Tree a strong, upright grower, and a heavy bearer.

Baxter (La Rue): The Baxter is a large handsome apple which is growing in popularity every year. It originated with Mr. La Rue, near Brockville, Ont. It does not bear much until the tree has been over ten years planted, but from that time on it bears a medium crop almost annually. The Baxter has not been exported much yet, but it is such an attractive apple in the barrel that it is bound to be popular, and already high prices have been paid for it, in at least one instance it having been quoted higher than

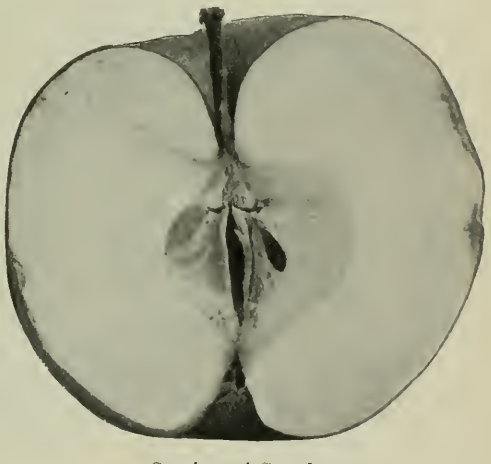
Tompkins' King, to which, however, it is much inferior in quality. It may be described thus:

Fruit very large, roundish; cavity deep, medium width to open; stem short to medium, slender to moderately stout; basin medium depth and width, smooth; calyx open; colour yellow, well splashed and washed with orange red with purplish splashes; dots moderately numerous, large yellow, prominent; skin thick, moderately tough; flesh yellow tinged with pink, coarse, moderately juicy, tender, core small; above medium quality; season December to February.

A very large handsome apple, but too coarse for dessert purposes and not juicy enough.

Oscar: This is a seedling originated at the Central Experimental Farm, Ottawa, and is of Russian origin, the seed having been imported from Riga, Russia. The tree, which is hardy, vigorous, productive, and a moder-

Granby.



Section of Granby.

ately upright grower, fruited for the first time in 1897. The fruit is above medium size, conical, almost oblong, cavity narrow, medium depth, russeted near base, stem medium length, moderately short; basin shallow to medium, medium width, wrinkled; calyx closed; color pale yellow well washed and splashed with bright, attractive, crimson and having a thin pinkish bloom; dots moderately numerous, grey, indistinct; skin moderately thick, moderately tough; flesh white with traces of red, tender, juicy; core above medium size; briskly subacid with little decided flavor; quality above medium; season October and perhaps later. This is a very handsome apple somewhat resembling Chenango. It would sell well, as it is in season just before Wealthy. Being firm it should also ship well.

Granby: The Granby apple is a cross-bred variety, originated at the Central Experimental Farm by Prof. John Craig, the parents being McMahon, female, and Scott Winter, male. The tree is a strong grower and has proved quite hardy so far. Its productiveness has not yet been determined as it has not been fruiting long enough. It is, however, a fairly early bearer. The fruit is medium to above medium in size, oblate to roundish, conic, somewhat angular, cavity narrow, deep russeted; stem short,

moderately stout, basin deep, medium width, wrinkled, calyx small, closed, color yellow, well washed and splashed with attractive orange red; dots obscure; skin moderately thick, moderately tough; flesh dull white, with traces of red, tender, moderately juicy; core medium; briskly subacid with not very decided flavour; quality above medium. Season December to late winter. This variety is much like a large Scott Winter, but not quite so tender in flesh. It is handsome in appearance and may take the place of Scott Winter.

Walter: The Walter apple was originated by P. C. Dempsey, Albury, Ont., and later of Trenton, Ont. It is a cross, the parents of which were Golden Russet, female and Northern Spy, male. The tree is a strong grower and has proved quite hardy at Ottawa. As a top graft it bears heavy crops

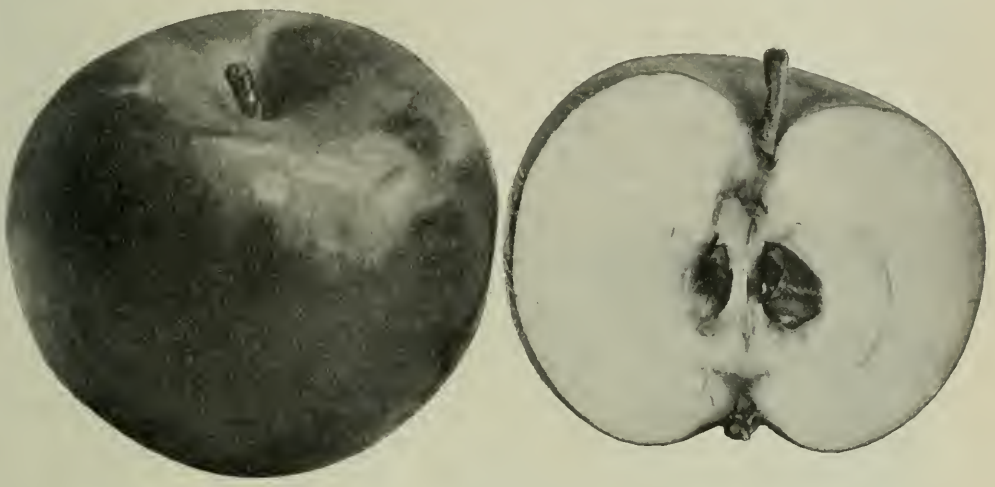
Walter.

Originated by the late P. C. Dempsey, for many years an honored director of the Ontario Fruit Growers' Association, and named after his son Walter H.

in alternate years. Fruit roundish rather irregular; size very large; cavity deep, medium width; stem short, moderately stout; basin deep, medium to open, almost smooth to moderately wrinkled; calyx open; colour greenish yellow, splashed and streaked with red; dots few, small, white distinct; skin moderately thick, moderately tender; flesh yellow, tender, rather coarse, juicy, melting; core small; subacid, pleasant high flavour; quality good to very good. A suggestion of Gravenstein flavour about this apple; season, October.

La Victoire: This variety was introduced by the late Robert Hamilton, Grenville, Que. It originated near Grenville and has been grown at Ottawa for the past nineteen years. It is probably a seedling of Fameuse. Fruit above medium size, oblate, regular; skin greenish yellow, almost covered with crimson; dots fairly numerous, gray, distinct; cavity of medium depth and width, slightly russeted; stem short and stout; basin of medium depth and width, almost smooth; calyx open and medium size; flesh white, tinged

with red, rather coarse, moderately juicy, mildly subacid, with a pleasant flavour; core small; quality good; season, midwinter; tree hardy and a strong, moderately spreading grower. This variety has not, so far, proved very productive, but is a handsome apple, and on account of its season and hardiness will probably prove useful in the north.



La Victoire.

EXPERIMENT STATION EXHIBIT AT CANADIAN NATIONAL EXHIBITION.

By P. W. Hodgetts, Department of Agriculture, Toronto.

In acordance with orders from the Board of Control, an exhibit of fruit was prepared by Mr. T. B. Revett of the Department of Agriculture and myself for the second week of the Show, September 2-7. The same idea as in 1906 was followed, viz., to show as many as possible of the varieties of fruit recommended by the Board for planting in Ontario. Of course, many of these varieties were out of season, but by the use of cherries and the small fruits in preservatives, a fairly complete showing was made. Large placards were conspicuously displayed giving complete lists as outlined in our Bulletin.

The magnificent new building used this year for Horticulture added much to the attractiveness of the display, and it is to be greatly regretted that owing to the very unfavorable season, such a poor showing was made both in fruit and in flowers. As the fruits were two weeks later than usual in ripening, the grapes were particularly poor, being absolutely green and hard. Indeed, the only blue grapes grown outdoors with any color were those shown in the Station exhibit and specially ringed by your Experimenter, Mr. Pettit. Apples, while fairly well colored, were small, showing the effects both of the late season and the summer drought. The other fruits in the general exhibits were fairly good, especially plums.

In procuring these fruits for our Exhibit it was necessary to get the varieties from every source available. Apples were obtained from

Burlington, Trenton, and Collingwood, pears from Grimsby and Trenton, plums and peaches from Winona, St. Catharines, and Grimsby. The bottled fruit was put up by Mr. Sherrington and Mr. Peart mostly in 1906, and had been exhibited at Winnipeg and the Horticultural Exhibition of 1906 in Massey Hall. Most of it was in excellent condition despite the constant handling in moving from place to place. It is to be regretted that all of the varieties of cherries especially were not put up in this form. Something ought to be done also in obtaining and maintaining a full collection of such fruit, as plums, pears and peaches, in as far as it is practicable. The Department of Agriculture is now considering the advertising of Ontario fruit products in various parts of the world, and, to be representative, exhibits should show all these fruits in some form.

Toronto Industrial Exhibition, 1907. Exhibit of Fruit Stations.

Much interest was manifested in the exhibit by all manner of people. Some were merely curious about the fruit, specially those in bottles, but many were anxious for information as to varieties, fungous diseases and insects, care of orchards, etc. The old question of what varieties to plant for either home use or for export trade is yet the all important one, and the placards giving this information as outlined by the Board of Control were constantly referred to. The presence of these varieties in the natural state gave added interest to those seeking such information.

An exhibit of 50 varieties of tomatoes grown by the Horticultural Department at Guelph proved very attractive and should be repeated, and possibly be added to, another year. A few cases of fruit showing proper methods of packing and style of packages were kindly loaned by the St.

Catharines Cold Storage Association as in 1906. Some of the bottled fruits were also contributed by the same Association for the Winnipeg Show and held over for the Industrial. Several plates of apples contributed by Mr. Macoun from the Central Farm orchards were unusually attractive in color and caused considerable comment. These were of two varieties, Lubsk Queen and Livland Raspberry, the former being little known in Canada outside of the Central Experimental Farm.

At the close of the Show, such fruit as was still good was re-packed and shipped together with the bottled specimens to the St. Catharines Horticultural Exhibition which was held the following week. As far as possible a repetition of the Toronto exhibit was made there, many of the varieties being filled in from local sources. The general display at this Exhibition was far in advance of that at Toronto, and it was well worth a trip to the Garden City to see the vegetables and fruit in such perfect form. It is to be regretted that the attendance is, as yet, not as large as the Show deserves.

The varieties on exhibition at Toronto were as follows:—

Apples: Duchess, Gravenstein, Wealthy, Alexander, McIntosh, Fameuse, Blenheim, King, Hubbardston, Greening, Baldwin, Spy, Ontario, Stark, Primate, Wagener, Swazie, Tolman, Mann.

Pears: Clapp, Bartlett, Boussock, Flemish, Howell, Louise, Duchess, Bosc, Clairgeau, Anjou, Keiffer, Sheldon, Lawrence, Josephine, Winter Nelis, Seckel.

Plums: Bradshaw, Imperial Gage, Gueii, Shippers' Pride, Lombard, Quackenboss, Yellow Egg, Grand Duke, Golden Drop, Reine Claude, Abundance, Burbank, Chabot.

Peaches: St. John, Mountain Rose, Early Crawford, Champion, Elberta, Reeves.

Grapes: Moore, Campbell, Worden, Concord, Wilder, Delaware, Lindley, Agawam, Vergennes, Niagara, Diamond, Moyer, Winchell, Champion.

Cherries: Knight, Napoleon, Montmorency, Elkhorn, Richmond.

Strawberries: Warfield, Saunders, Bederwood, Dunlap, Lovett.

Currants: Cherry, Fay, Prince Albert, Wilder, White Grape.

Raspberries: Columbian, Marlboro, Cuthbert, Golden Queen.

Gooseberries: Pearl, Downing, Whitesmith, Red Jacket.

REPORT OF THE INSPECTOR OF FRUIT EXPERIMENT STATIONS.

Prof. H. L. Hutt, Ontario Agricultural College, Guelph.

The work of variety testing has been continued at the various Fruit Experiment Stations throughout the Province the same as in previous years. I have inspected each of the Stations during the year, and shall briefly refer to the work in progress at each.

At the southwestern station in Essex County, Mr. J. L. Hilborn has set out for experimental purposes a varied collection of fruits, among which there was a good assortment of varieties of peaches and plums. The season was somewhat unfavorable for newly planted stock because of the cold, late spring and drought during the later part of the summer. However, most of the stock has lived and done fairly well. The failures Mr. Hilborn attributes to weakened vitality from fumigation.

Since the severe winter of 1903 and 1904, when most of the peach orchards were destroyed, fruit growers of this district have been giving more attention to the growing of vegetable crops, such as melons and tomatoes, and forcing house crops of tomatoes, lettuce and cucumbers. The crop of tree fruits was almost a total failure in this district his year. Mr. Hilborn has been appointed manager of the Erie Fruit Company Co-operative Association, and is in close touch with the fruit and vegetable interests of the district, and is determined to do all he can to make the Experiment Station work of value to that section of the country.

Mr. E. E. Adams, also of Leamington, has been giving his attention principally to the testing of vegetable crops, and will be able to report this year upon experiments conducted with melons, tomatoes, potatoes, peppers and other forcing house crops. The unseasonable late frosts destroyed the early set plants of tomatoes and more or less affected the crop throughout the season. Nevertheless, Mr. Adams will be able to report upon experiments which will be of value for his district.

At the Wentworth Station, Mr. Murray Pettit, Winona, has tested a large collection of grapes, and has pretty thoroughly settled the question as to the leading varieties at the present time for his district. However, it will be necessary to test the new varieties from time to time as they come out, and these should be introduced and tested in comparison with the standard varieties as soon as they make their appearance. He has also good representative collections of varieties of pears, plums, and peaches, from which he is able to judge of the leading varieties of these under his conditions of soil and climate.

At the Maplehurst Station, Mr. Woolverton, Grimsby, has a large collection of varieties of all the leading kinds of fruits, and is in a position to give some valuable information regarding varieties of cherries, plums, pears, and peaches. The crop on most of these this year was light, cherries being almost a complete failure. He will be able, however, to give some valuable notes upon peaches, of which he has a large number under test. The marked difference in the light sandy loam at Mr. Woolverton's, and the heavy clay loam in Mr. Pettit's orchards, should furnish a good opportunity for the comparison of varieties under different soil conditions. The adaptability of varieties to certain localities has been well worked out by our Fruit Experiment Stations. The adaptabiltiy of the leading varieties to the various soils is one that might yet be worked out in the same way.

Mr. A. W. Peart, at the Burlington Station, made a specialty at first of blackberries and currants. This part of the work he has conducted to a finish and is not now growing either of these fruits extensively. He has, however, extensive plantations of a number of other fruits upon which he can furnish valuable reports. His vineyard contains a large number of varieties, and because it is considerably north of the Niagara District where the bulk of the Ontario crop is grown, his reports on varieties would be of value to a wide area where grapes are grown in a more limited scale. He has also a young experimental pear orchard coming into bearing, and two good apple orchards in full bearing. In one of these are about thirty varieties of Southern apples introduced by grafting into bearing trees. These are now beginning to bear and should furnish interesting data for Mr. Peart's reports.

Mr. E. B. Stevenson, our strawberry expert, has retired from the ministry, in which he was engaged, and has settled permanently at his old home in Guelph. He is now giving most of his time to the growing and testing of strawberries. His plantations are well worthy of a visit by anyone interested in this fruit, for they contain not only all the best standard varieties, but all of the newest and latest introductions. His repu-

tation as a specialist on strawberries has put him in touch with similar specialists all over the continent, and he is usually favored with plants for trial of every new variety as it is introduced. His reports are worth to the public many times what our Board pays for them, and they are freely quoted in nurserymen's catalogues.

At the Lake Huron Station, Mr. A. E. Sherrington, Walkerton, has an extensive collection of varieties of the fruits which can be grown in his part of the country. He has conducted for several years reliable tests with raspberries, gooseberries, and plums, and is putting out commercial plantations of the leading varieties of these. His young orchard of apples and pears is just nicely coming into bearing, and will in time furnish valuable information regarding the varieties best adapted to that section of the country. His bearing apple orchard is made up of the varieties usually grown in commercial orchards of that district, and is a profitable one.

At the Georgian Bay Station, Mr. John G. Mitchell's plum orchard at Clarksburg has suffered severely from the severe winters of late, the older orchard being nearly all killed out. In the young orchard, however, there are a large number of varieties which have not yet been fully tested. Many of these Mr. Mitchell should be able to report upon this year. He is now manager of one of the largest co-operative associations in the Province, and his time is so largely taken up with that work that he would be glad to be relieved of the Fruit Experiment Station work.

The Simcoe Station, in charge of Mr. G. C. Caston, Craighurst, has extensive collections of varieties of the various kinds of fruits most likely to succeed in that district. Mr. Caston has had a long and varied experience in testing of hardy varieties, and the result he has obtained are of great value to intending planters in his section. Of late years many of the varieties formerly supposed to be hardy have succumbed to severe winters, and the list of varieties formerly recommended for that section will have to be more or less revised as a result of further testing.

At the Bay of Quinte Station, Mr. W. H. Dempsey, Trenton, has one of the largest collections of varieties of apples in the Province. Many of these have been added from time to time by grafting on to bearing trees, and these Mr. Dempsey has been reporting upon. His large commercial orchard, however, affords ample opportunity for selection of varieties best adapted for commercial as well as domestic planting in that section. Mr. Dempsey is now manager of one of the large co-operative shipping associations for his district, and he is in a position to give valuable information regarding commercial handling of apples for the Old Country market.

At the St. Lawrence Station, Mr. Harold Jones' orchard at Maitland, has suffered more or less from the severe winters during the past couple of years. The old orchard which was at its prime when the experimental work was begun now begins to show the effects of severe winters, and the bearing of heavy crops of fruit. The young experimental orchard is just nicely coming into bearing, and from it Mr. Jones expects to get some valuable information regarding varieties suited to his soil and locality. He has put out a new commercial apple orchard, using the McMahon White as a hardy stock upon which he is top-working Fameuse with scions from the best tree in his old orchard. This careful selection of scions should give him a uniform lot of fruit of the best type.

The conditions at this station are so different from those at Ottawa, nearly one hundred miles away, that Mr. Jones feels certain that the results of experiments at Ottawa will never as fully meet the requirements of his district at tests conducted in it, and he is desirous as far as lies in his power of carrying on to a finish the work he has begun.

Probably the station from which information has been most keenly sought by the largest number of people has been that in the Northern District. The settlers in New Ontario, north and west, are particularly anxious to know what will be most likely to succeed with them. Mr. Charles Young, our experimenter at Richard's Landing, Algoma, has had under test for a number of years a large number of varieties of fruits most likely to succeed in that northern section. For a number of years it appeared from his tests that it was possible to grow a great many more kinds of fruits in that northern district than was commonly supposed; but the severe winters during the last couple of years has severely tested the hardiness of most kinds of fruits, and many of the varieties which did well for a number of years have succumbed at last to winter killing.

One feature of orchard management which has shown itself necessary for the north is the growing of low-headed trees which are not so liable to injury from sun scald.

I did not visit the experimenters in the Temiscaming District to whom stock has been sent for testing, as it is too soon yet to look for results from it. As soon as the new pioneer farm in that district has been cleared of forest and is ready for planting, we should have a good collection of fruit of the hardiest kinds sent there for testing, as probably the greatest demand at the present time is for information regarding varieties most likely to succeed in the new districts of Ontario which are now being opened up.

In closing this report, I wish to call attention to some of the conditions which have materially affected the fruit crop of the Province during the past season.

In the first place, the weather has been exceptional. The winter was not severe and fruit trees as a rule wintered well. Bloom was abundant, but during the time the trees were in bloom the weather was cold and windy and very unfavorable for the working of bees, which are the most active agents in the pollination of the blossoms. In fact, there were only two bright warm days, and these several days apart, during the whole season of bloom that the bees worked at all freely. Mr. Murray Pettit informed me that he noticed two distinct settings of the fruit on his cherry trees which he believed corresponded to the two good days the bees had for pollination.

In the second place, there was an unusual scarcity of honey bees this year to do all the pollination necessary to the setting of a full crop of fruit. I was informed by a leading beekeeper that not more than twenty per cent. of the honey bees of the Province were wintered successfully last winter. This being the case, it is easy to understand the effect that a scarcity of bees with unfavorable weather for their work had in giving a light crop of fruit. I have noted repeatedly in various parts of the Province that some of the most productive orchards have been those in which honey bees are kept, and there is no question in my mind that it would pay fruit growers well to keep a few hives of bees merely for the purpose of insuring fertilization of fruit blossoms. In sections where fruit farms are close together as they are in the Niagara District, the growers within a radius of one or two miles might co-operate and employ a competent beekeeper to look after a good size apiary.

REPORTS FROM THE FRUIT EXPERIMENT STATIONS* FOR THE YEAR 1907.

SOUTHWESTERN FRUIT EXPERIMENT STATION.

By J. L. Hilborn, Leamington, Ont.

I presume it is already quite generally known that this locality has suffered another reverse in its peach industry, by the severe frost which occurred early in October, 1906. At most points in the Province considerable snow fell at this time, which had the effect of affording considerable protection to the trees from the frost, although it destroyed many by its weight. In the Leamington District very little snow fell, and the frost was therefore more severe.

Mr. J. L. Hilborn's 20 acre peach orchard. Two year old trees.

Peach trees under three years old, as a rule do not ripen their wood as early as older trees, and it was this class of trees that suffered. Trees that were old enough to bear, and also young trees that were cultivated but little, and were therefore well ripened at the time of the frost, sustained but little loss, while hundreds of young trees that were not well ripened were killed outright. The seriously damaged portion of the trees, in almost every case that came under my notice, was about midway between the fork and the base of the tree, the bark being completely killed for several inches at that point.

I might state here that the greater portion of the peach district in Western Michigan suffered much worse than we did, as many thousand acres of peach trees and Japan plum trees were reported as being killed outright. The northern part of the peach district there received quite a fall of snow at this time and therefore escaped severe injury from the frost, and the orchards in that vicinity produced a heavy crop this season.

What peach orchards we have in this district are as a rule making a satisfactory growth, and a few orchards are being planted each year, but planting is not very general.

Note by Secretary: In editing the reports in this volume I have given each one complete in itself, instead of separating its parts under the various fruit heads, which was done previously for the convenience of the reader. My object is to show more clearly the work of each station. I am adding a complete index to serve the purpose attained without it in the previous reports.

I have but little to report this season, as far as the fruit crop is concerned. Fruit trees of nearly all varieties produced but a light bloom, and shortly after the peaches, plums and cherries were set, we had a severe frost, to which I attribute the failure of our crop. The failure was so complete that but few had fruit enough for their own use, even among the leading growers. Plums were also a complete failure, and cherries very light, perhaps ten per ceit. of an average crop. Pears and apples are also very scarce. It was the most complete failure of fruit that I have ever experienced.

For the past few years growers here have been plowing up their berry plantations, largely on account of the difficulty experienced in obtaining satisfactory assistance for growing and harvesting, and the acreage grown here now is very limited. Those who had plantations received a fairly good crop, with the exception of blackberries, which were light.

Very few grapes are grown here since the vines were destroyed by roots freezing in 1899. Those who have vines growing received this season a good crop, except in some locations near the lake, where the rose beetle completely destroyed every bunch. This has been the case in my own vineyard for several years.

I planted last spring for experimental purposes,—Strawberries, 7 varieties; raspberries, 14 varieties; blackberries, 5 varieties; currants, 8 varieties; plums, 18 varieties; peaches, 36 varieties; and a few other fruits. The small fruits have mostly made an excellent growth, and the plum trees have also nearly all grown well, but very many of the peach trees failed. This I expected at planting time, as the trees were in very bad condition, having been killed either by frost last fall or by severe fumigation.

I was very much disappointed at not having a good stand of peach trees for experimental purposes, as I consider the experiments with this fruit to be of much more value for this district than all the others combined, and shall certainly put forth my best endeavors to secure a good stand next season. I have however secured a good growth on some choice, new varieties obtained from Michigan, and hope to procure something valuable from them for experimental purposes.

What peach orchards I have remaining, as well as others in this vicinity, have apparently ripened up in good shape, and appear to be in excellent condition to bear a crop next season. Last season the San José scale made its appearance more or less on almost every farm in this district, and multiplied very rapidly. Spraying with lime and sulphur was very generally adopted last spring, and apparently destroyed nearly all the scale. Part of the orchards on my own place became badly infested last year before I was aware of its presence, and the one spraying with lime and sulphur, thoroughly applied, last spring, has apparently almost completely cleared it out. I have found but very few live scale this season.

Since the destruction of peach orchards in this vicinity several years ago, fruit growers have been turning their attention more and more to the production of certain classes of early vegetables. The writer was first to take up the different branches of this industry but the followers are now legion. Present appearances indicate that the production is increasing too rapidly for the available market. A number of us this season formed a co-operative association and packed our output at a central packing house, and sold under one head about fifty carloads of vegetables, consisting of tomatoes, muskmelons, cucumbers, early cabbage, sweet corn, peppers, etc. We found many advantages in this method of handling our crop, while it has also some disadvantages. This having been a very unfavorable season, it requires another year's test to decide its value.

I have been growing some vegetables under glass for two seasons and the crop this year was very satisfactory and good prices obtained. The house used for this purpose is forty by one hundred feet, and was planted late in March with tomatoes and cucumbers, both of which did well. Last season I grew quite a number of varieties of tomatoes, of which Dreer's "Best of All" and "Frogmore" did the best. This season I grew "Chalk's Jewel" "Best of All" and "Frogmore," and the varieties did best in order named. Varieties of cucumbers tested were "Satisfaction" and "Arlington," both of which were very satisfactory. A few plants of a long English variety, "Carter's Perfection" also did very well.

MAPLEHURST FRUIT EXPERIMENT STATION.

By Linus Woolverton, Grimsby.

Cherries.

The Season. The season has been an unfavorable one for all fruits in the Niagara District, except perhaps for apples and grapes. Peaches and plums set heavily, but have been dropping all through June and July, until now the prospect is for a small crop. The cherries bloomed very freely, but did not set well, and of those which did form a large number blighted and dropped.

Professor Hutt of the Agricultural College, Guelph, on his visit in July stated that his observations led him to attribute the dropping of the fruit to imperfect fertilization. The great scarcity of bees might explain the whole mystery, for to these agents the fruit grower is far more deeply indebted than he is aware. The many small, imperfect fruits, without seeds, tend to confirm this view, and to make us believe that fruit growers should keep bees, which will enrich them in two ways, first, by their honey and, secondly, by increasing the yield of their fruit crops.

Fungi.

The *Black Knot* of the cherry, which had not been seen in my cherry orchard for many years, was much in evidence this spring. The Montmorency and the English Morello were especially attacked, while the Dukes also showed it considerably. Having noticed in the April pruning the small black knots, which grew unobserved among the leaves last season, I at once gave them my attention, and went over my whole orchard, cutting out and burning up every knot I could find; for if left neglected, it is surprising how quickly they ruin an orchard.

The Cherry Rot was again very troublesome. Knight's Early was almost free, Governor Wood was very little affected,Tartarians were somewhat subject, but Windsor, Elkhorn, Napoleon, and even some of the Kentish Pies, were nearly worthless.

The *Time of Ripening* of the various kinds was unusually late, no variety being ready before July. Governor Wood, which in 1905 was harvested between the 22nd and the 27th of June, and even earlier in 1906, was harvested this season during the first week in July. The Montmorency which was harvested about the 10th of July, in 1906, was harvested about the 20th in 1907.

This we may say of all varieties, that they ripened this season from seven to ten days later than in ordinary seasons and the dates for each variety ripening this season would not be a fair criterion for average years.

CHERRIES.—SHOWING TRUE CHARACTERISTICS DURING TEN YEARS' GROWTH ON MAPLEHURST FRUIT FARM AT GRIMSBY, ONTARIO.

Variety.	Season.	Class.	Habit.	Vigor.	Hardiness.	Productiveness.	Value.
Abbesse	Mid. July	Morello...	Round h'd	8	7	4	4th rate.
Bruseler Braune	Early Aug.	" ...	"	8	8	5	3rd "
Bessarabian	.....	.....	.....	8	9	5	3rd "
Belle Magnifique	Mid. July	Duke	.....	6	.....	.....	3rd "
California Advance	Early July	"	Upright ..	8	6	7	1st "
Cleveland	Mid. June	Heart	Spreading.	8	5	8	1st "
Choisy	Early July	Duke.....	Upright ..	6	4	4	3rd "
Coe	July	Heart	Spreading.	10	6	6	2nd "
Connecticut Black Heart	.....	"	"	7	5	.....	.....
Dykeman	.....	Bigarreau.	"	7	.....	.....	.....
Dyehouse	Mid. June	Pie.....	Round....	6	8	9	1st rate.
Eagle	Mid. July	Heart	Pyramidal	9	5	4	3rd "
Early la Maurie	.....	.....	Upright ..	10	.....	.....	.....
Early Purple	Early June	Heart	Pyramidal	10	5	5	3rd rate.
Early Richmond	Mid. June	Pie.....	Round.. .	5	8	8	1st "
Elkhorn	Mid. July	Bigarreau.	Pyramidal	9	5	10	1st "
Elton	End June	Heart	"	10	5	9	2nd "
Empress Eugenie	"	Duke.....	Upright ..	8	5	6	3rd "
English Morello	Mid. July	Morello...	Round....	5	8	10	1st "
Governor Wood	Mid. June	Heart	Spreading.	8	5	8	1st "
Grenner Glas	Mid. July	.....	Upright..	8	.....	.....	.....
Griotte du Nord	.....	Morello...	Round....	6	8	6	.....
Hortense	Early July	Duke.....	Spreading.	9	5	6	2nd rate.
Ida	End June	Sweet	Upright ..	7	.....	5	3rd "
King's Amarelle	.....	Pie.....	Round....	9	.....	.....	.....
Knight	End June	Heart	Spreading.	10	6	9	1st rate.
Kosloo	End July..	Morello...	Bush	2	9	4	4th "
Late Duke	Early July	Duke.....	Upright ..	9	6	7	1st "
Lutovka	Mid. July	Morello...	" ..	7	.....	.....	.....
Love Apple	.....	.....	Spreading.	6	.....	.....	.....
Litham	Mid. July	.....	.....	8	7	6	.....
May Duke	Mid. June	Duke.....	Upright ..	9	6	8	1st rate.
Mezel	Mid. July	Bigarreau.	Pyramidal	10	6	7	2nd "
Montmorency	Early July	Pie.....	Round....	7	7	9	1st "
Mazzard	"	Heart	Pyramidal	10	6	7	3rd to 4th.
Montmorency Ordinaire	"	Pie.....	Round....	7	7	9	1st rate.
Napoleon	"	Bigarreau.	Spreading.	8	6	10	1st "
Olivet	End June	Duke.....	Round....	6	5	5	3rd "
Orel	Mid. July	Pie.....	"	5	10	8	1st "
Ostheim	"	Morello...	Slender...	5	8	4	4th "
Purity (probably Dyehouse)	End June	Pie.....	Round....	6	7	9	1st "
Phillippe	.....	.....	.....	.....	.....	.....	4th "
Red May	.....	.....	Upright ..	6	.....	.....	4th "
Rockport	End June	Bigarreau.	Spreading.	7	5	9	3rd "
Royal Duke	"	Duke.....	Upright ..	9	6	9	1st "
Russian 207	Mid. July	"	" ..	8	8	8	1st "
Schmidt's Bigarreau	Early July	Bigarreau.	Spreading.	10	.....	3	4th "
Schatten Amarelle (or Shadow Amarelle)	Mid. July	Morello...	Slender...	6	.....	4	4th "
Spate Amarelle	.....	" ...	Round....	5	.....	.....	.....
Strauss Weichsel	End June	.....	.....	7	.....	.....	.....
Suda Hardy	Early July	Morello...	Round....	7	.....	6	3rd rate.
Tartarian	"	Heart	Pyramidal	9	4	7	1st "
Vladimir	Mid. July	Morello...	Slender...	5	8	4	4th "
Windsor	Mid. to end July ...	Bigarreau.	Spreading.	10	7	8	1st "
Wragg	Mid. July	Morello...	Round....	5	8	10	1st "
Yellow Spanish	Early July	Bigarreau.	Spreading.	10	5	5	1st "

Abesse: Piclo; no crop: tree unproductive; of no value.

Bruseler Braune: Morello: no crop.

Choisy: Duke; tree lacks vigor, bore small crop, cherries scattered over the tree, single, not productive enough to be of any value for market; fruit very delicious, almost honey sweet, well worthy of a place in the home garden as a dessert fruit; of no value for cooking.

Cleveland: Heart; no crop; fruit resembles Wood, and about the same season.

Coe: Heart; no crop; tree productive; fruit too tender for the commercial orchard.

Downer: A very small crop: tree not productive.

Dyehouse: Kentish Pie: ripened early in July, first before Richmond; not quite so productive as in 1906; seems to keep up its reputation as a commercial kind.

Experimental cherry orchard of L. Woolverton, Grimsby, Ont. Eighty varieties under test.

Eagle: Heart; no crop; just a few stray cherries: should not be recommended, except for the garden of the amateur.

Elton: Bigarreau: a small crop, so subject to rot that no fruit was harvested; too soft to be valuable as a commercial variety.

Eugenie: Duke; no crop: tree not very productive.

Hortense: Duke: trees showing lack of vitality: not productive this season. This cherry is the largest and finest of the Dukes, but the tree has not kept up its productiveness. One or two seasons it excelled every variety of Duke, and I was inclined to recommend it very highly for the commercial orchard, but now I am disposed to place it only in the domestic list.

Knight: Heart; tree wonderfully vigorous; one tree at Maplehurst is fifty years old, and still as healthy as ever; very vigorous, reaches a height of over thirty feet, a magnificent tree: very productive: yielded over 100

quarts this unfavorable season. Fruit, reddish black, large, excellent, not subject to rot or curculio. This variety has always given me satisfaction.

Late Duke: Tree vigorous, and very productive, even this unfavorable season; bears fruit in clusters which are easily and rapidly gathered. The fruit is semi-acid, not much subject to rot, and very desirable for pies and sauce.

May Duke: Duke; the trees still vigorous and healthy, after about ten years' growth from planting: fruit ripened early in July, and very desirable for cooking; smaller than Late Duke.

Mezel: Duke; tree very vigorous, about thirty years of age, but not as productive as formerly; fruit not equal to Tartarian, being rather too firm and lacking in quality. At one time I esteemed this variety very highly for the commercial orchard, but it has not given me as much satisfaction for several years past, and therefore I wish to modify my statements regarding its value.

Montmorency: Kentish Pie; tree vigorous and productive, but not as productive as in other seasons; requires plenty of sun to be productive, trees in partial shade, or too closely planted, give very small crops; fruit very free from curculio, not subject to rot unless left hanging too long on the trees Although grown so widely over the Province, this variety is still one of the best for market purposes.

Morello: Trees very productive but not as healthy nor as vigorous as the Montmorency; fruit inferior in flavor to Montmorency, but a very salable cooking cherry, and being later than the latter variety it is recommended for the commercial orchard, because it prolongs the shipping season.

Napoleon: Bigarreau; tree vigorous, ordinarily one of the most productive of varieties, but the trees in the experimental plot have been somewhat disappointing in this regard: Fruit so large and fine as to command the highest price but often very subject to rot. I would advise planting this variety sparingly in the commercial orchard.

Orel: Kentish Pie; ripens about with Richmond; very hardy.

Purity: Kentish Pie; probably identical with Dyehouse.

Russian 207: Maintains its character as given in 1905, for value and productiveness.

Schmidt's: No crop.

Spanish: Bigarreau; a magnificent grower: one tree about fifty years planted is over thirty feet high and spreads like an apple tree, a scanty bearer, but the size of the fruit makes every cherry count in filling the basket: fruit the finest and largest of the Bigarreaus and commands the highest market price. I do not advise planting this cherry extensively for market.

Windsor: Bigarreau; tree very vigorous, probably the strongest grower of all the kinds in my collection, requires severe cutting back or the tree would grow out of all bounds, and the fruit could not be harvested, needs also severe thinning out of the branches to give access to the sun's rays: fruit very large and fine when fully ripe, but often harvested before it has reached its attractive dark red color for fear of losing the crop with rot to which it is very subject; crop this year very small, and much subject to rot. I am much disappointed in this variety, having two hundred trees of bearing age.

PEACHES.—SHOWING TREE CHARACTERISTICS DURING TEN YEAR'S TEST ON MAPLEHURST FRUIT FARM AT GRIMSBY.

Variety.	Origin.	Season.	Vigor.	Hardiness.	Productiveness.	Value.
Alexander	Ill.	End July	8	8	10	2nd rate.
Barnard	"	Early Sept.	8	9	10	1st "
Beer's Smock	N. J.	Early Oct.	9	9	8	1st "
Brigden		Mid Aug.	8	8	8	1st "
Crosby	Mass	Mid Sept.	9	10	10	1st "
Champion	Ill.	Early Sept.	9	9	9	1st "
Elberta	Ga.	Mid. Sept.	10	9	10	1st "
Early Rivers	Eng.	Early Aug.	9	9	10	2nd "
Early Crawford	N. J.	Mid Aug.	10	7	7	1st "
Early Michigan	Mich.	"	7	8	8	2nd "
Fitzgerald	Ont.	"	8	8	7	1st "
Foster		End Aug.	7	8	6	1st "
Garfield	U. S.	Mid Aug.	7	8	7	1st "
Golden Drop	Mich.	End Sept.	8	9	9	2nd "
Greensboro		Early Aug.	9	9	8	2nd "
Hales	Ohio.	Mid Aug.	9	9	9	2nd "
Hill's Chili	N. Y.	Mid Sept.	7	9	8	2nd "
Jacques Rareripe	Mass.	"	8	8	7	1st "
Kalamazoo	Mich.	End Sept.	8	8	8	2nd "
Late Crawford	N. J.	"	9	8	7	2nd "
Longhurst	Ont.	Mid to end Sept.	8	10	10	1st "
Lewis	Mich.	End Aug.	9	9	8	1st "
Lorentz		Mid Oct.	7	7	5	2nd "
Mountain Rose	N. J.	End Aug.	8	8	8	1st "
New Prolific	Mich.	Early Sept.	9	10	10	1st "
Old Mixon	U. S.	End Aug.	10	7	5	2nd "
Reeves		Early Sept.	10	7	7	1st "
Smock	N. J.	Early Oct.	7	8	8	1st "
St. John		Mid Aug.	10	9	8	1st "
Stephen's Rareripe		End Sept.	9	8	8	1st "
Salway	Eng.	Mid Oct.	8	8	7	2nd "
Triumph	Mich.	Early Aug.	8	8	8	2nd "
Wager	N. Y.	Early Sept.	8	8	7	2nd "
Wonderful		End Sept.	10	7	4	2nd "
Wheatland	N. Y.	End Aug.	9	8	5	2nd "

BEER'S SMOCK: No fruit this year; a good crop in 1906, which ripened a little in advance of Smock, and averaged larger in size.

CHAMPION: In season early in September, with the last St. Johns; a very productive tree, and the fruit is a beautiful white flesh peach of excellent quality; one of the best, especially for the home garden.

CROSBY: In season toward end of September, just after the early Crawford; the tree is vigorous and productive, and the fruit a good shipper.

EARLY CRAWFORD: A general failure this season (1907), and what fruit was produced was much smaller than usual on account of the dry summer. Our best peach, but the fruit buds seem a little tender.

ELBERTA: Gaining in popularity; tree healthy, showing little if any curl leaf; yield heavy, and fruit large and well colored; sold at top prices.

FITZGERALD: Very similar to Early Crawford; possibly a little hardier in fruit bud; a fair crop, but smaller than usual.

FOSTER: A moderate yield of fine sample; especially desirable for home use.

Greensboro: Ripened about with Alexander, but more even in size, and ripened more fully so that it is more desirable for home uses; too tender for distant shipments.

Mountain Rose: A fair crop, and delicious for home uses.

New Prolific: Ripened early in September, and has borne a fuller crop than Early Crawford for two or three years past; a profitable kind.

Old Mixon: An excellent white flesh peach, but inclined to drop early; it follows the Early Crawford very closely, indeed it cometimes drops badly before the Crawfords are finished.

Rivers: I had planted this variety very freely, but found the fruit too tender for shipment, and therefore I have taken out nearly all the trees in the commercial orchard.

Smock: Too late in ripening to sell well this season; a light crop; often quite profitable.

Sneed: A fine yield this season, and the fruit was even sized and well colored; harvested between 20th and end of July, the very earliest peach we have, and valuable on that account.

Triumph: A moderate crop, of fair sized fruit; sold at a fair price for canning whole; twigs subject to blight.

View in M. Pettit's Vineyard, Winona. Grape rows half a mile long.

WENTWORTH FRUIT EXPERIMENT STATION.

By M. Pettit, Winona, Ont.

Grapes.

The cold weather during May and June did not prevent grapes from fertilizing better than they have for many years. The Massassoit, Moyer, Lindley, and other imperfect fertilizers were nearly perfect in bunch: nearly all of the discarded varieties bore better crops than ever before.

There was no grape rot nor scarcely any mildew, consequently our experiments in spraying did not give results. All varieties grown at this station have been fully described in previous reports and further description seems useless. This season again confirms the list of varieties previously recommended for planting for profit in the Niagara District, namely, in order of ripening:—Champion, Campbell, Worden, Delaware, Lindley, Moore's Diamond, Niagara, Concord, Agawam, Catawba, Rogers No. 4, No. 44 and No. 28; Vergennes also might be profitably added to the list on some soils and locations. Champion should only be planted where grapes ripen very early.

Campbell's Early, which has been recommended highly in previous reports, has shown a tendency to winterkill.

Catawba should only be planted on heavy soil where grapes ripen early. They should also be pruned close to prevent overloading and late ripening.

Plums.

Lombard yielded a greater profit per tree than any other variety this season, followed with Bradshaw and Monarch.

General Hand, Washington, Coe's Golden, Yellow Egg and many other fancy varieties were a failure. With my experience, General Hand and Washington should both be struck off any list for profit. Reine Claude is the most profitable light colored plum to plant; it is productive, good quality, long keeper and sells higher than any other.

Most of the Japans were a failure. Many of them are of no value and should not be planted, such as Carden, Ogon, Wickson, and many others. Burbank and Abundance are of some value, but should not be planted too largely.

Pears.

Pear blight has not been as destructive the past summer as it has been for the last three seasons. Duchess, Anjou, and Kieffer have suffered the least.

Duchess Dwarf is the only pear that I would recommend planting for profit in this locality, while the blight continues as destructive as it has been for the past few seasons. It bears young and continues to bear good regular crops. Three hundred trees planted at this station in 1880 are healthy and bearing good crops.

Bessarabian was again this season the most profitable cherry at this station and Elberta the most profitable peach.

BURLINGTON FRUIT EXPERIMENT STATION

By A. W. Peart, Burlington.

General Notes.

Upon the whole, the fruit crop was rather a satisfactory one. While the quantity may have been less than normal, the general quality was good, and prices ruled considerably higher than for some years.

While the fluctuating winter temperatures practically eliminated some fruits, and the cold, backward spring retarded vegetation, still the fine, long,

open fall, gave opportunities for garnering the crop without waste. Fruit trees and plants are also going into winter quarters with firm and well-matured tissue, as there has been but little growth since the middle of August.

Apples were a fair crop of perhaps normal quality. A large percentage was injured by the codling moth, which was never so destructive. There was little or no spot, however, and the caterpillar and canker worm were practically absent. The apple maggot did some damage—a comparatively new enemy, which will require further investigation.

Commercial List: Astrachan, Duchess, Wealthy, Ribston, Blenheim, King, Greening, Baldwin and Spy.

Pears were a moderate crop of excellent quality. Anjou and Kieffer were perhaps the shyest. There was practically no spot nor scab.

Commercial List: Wilder, Clapp, Bartlett, Boussock, Louise, Duchess, Anjou, Kieffer, Winter Nelis.

Plums were a good crop. Among the Japan varieties, Satsuma and Burbank fruit buds appear to be less resistant to hardships than many of the other kinds. The same seems also to be true with Glass Seedling and Reine Claude of the domestic class. Plum rot was not very general, neither did the curculio do much damage, although the fall web worm was quite plentiful.

Commercial List: European: Bradshaw, Niagara, Imperial Gage, Lombard, Yellow Egg, Glass, Reine Claude, Staunton. Japan: Red June, Abundance, Burbank, Chabot and Satsuma.

Peaches: Outside of the Crawford, Crosby, Longhurst and Elberta, there were very few peaches, and these only in sheltered situations.

Commercial List: Sneed, Alexander, St. John, Early Crawford, Champion, Elberta and Smock.

Grapes were the best crop ever grown here. The quality was also good, mildew being very rare. The season was about a week later than the normal so that in some locations the ripening of some varieties was scarcely completed. Most of the crop was, however, gathered without waste before the severe frosts.

Commercial List: Black, Moore's Early Worden, Concord: Red, Delaware, Massassoit, Lindley, Vergennes; White, Niagara, Diamond.

Cherries: Sour and sub-acid cherries were a fine crop. The Windsor, Montmorency, and Morello, were eminently good. There was little rot, and timely spraying also checked the codling worm. Cherries appear to flourish best on high, well drained, sharp, gravely soils.

Commercial List: May Duke, Early Richmond, Windsor, Montmorency, and English Morello.

Blackberries were not a heavy crop. The drought at ripening time materially decreased the marketable fruit, particularly in plantations not well pruned nor carefully cultivated. Price 9 to 10c. per quart at Burlington. (f.o.b.). For commercial list see notes on blackberries found elsewhere in this report.

Raspberries were a light crop. The canes were severely injured by the winter, the Cuthbert especially, although the Marlboro did not escape. The grub also injured some plantations. Price here 10c per quart.

Commercial List: Marlboro, Herbert and Cuthbert (red varieties).

Gooseberries were a good crop, price here 65c. per eleven quart basket.

Commercial List: Pearl, Downing and Red Jacket.

Currants were a fair crop, prices here were 65c. for reds, and $1.00 for black, per eleven quart basket. For commercial list see notes on currants.

Strawberries were only a moderate crop. Those patches not protected during the winter were materially injured. Prices here were 6c. to 7c. per quart.

Commercial List: Leader, Senator Dunlap, Williams.

Apples.

Twenty-five varieties of Southern State apples bore fruit last year and were fully described in station report. Other varieties of the same class fruited this season for the first time as follows:—

Black Ben Davis: Medium size; long stem; roundish conical; cavity and basin medium; color dark red; shaded with yellow; quality poor; flavor acid; season winter; yield 3 apples.

Carter's Blue: Small fruit; medium cavity and basin; long stem; color bluish, brown and green; season winter; yield 2 quarts.

Swaar: Medium to large apple; yellow with slight crimson flush; skin rough and dotted; form roundish flat; slightly ribbed; stem medium length; basin and cavity medium; rich, pleasant sub-acid flavor; season, mid-winter; yield ¾ bushel.

Milam, Minnesota Pippin, Red Limbertwig, Bonum, Gill's Beauty, Carter's Blue, and L. S. Pearmain are very inferior specimens of apples.

Efforts were made to reduce the ravages of the Codling moth. Apple trees to the number of 200 were banded in late June with burlap or coarse sacking. They were removed three times—in July, August and September—and the worms (pupæ) destroyed. The bands would average about 17 worms each time, or 51 per tree, or about 10,000 in all, during the growing season. The crop of apples was light—only some 300 barrels—of which over one-half graded for export. Had it not been for the bands, probably only a small portion of the above quantity would have been shipped, for the moth was destructive beyond all precedent.

The great point with bands is to attend to them, otherwise they aggravate the trouble. Hogs were also kept in the orchards, thus still further eliminating the worms.

Pears.

The French pears planted in 1900 have not yet fruited. They were very small when set, probably only a year old. They and the Hoosic dwarfs (1905) have made a fair growth. Of the trees planted in 1897 all have borne fruit, and been reported save the Tyson (see report 1904). The Tyson is still barren, although the trees are vigorous, upright growers.

The Sudduth bears very freely but the fruit is comparatively worthless, resembling walnuts and having a thick, rough, tough skin. The flesh is coarse but rather sweet, juicy and pleasant to the taste. Season, October.

The Sheldon was exported this year to Glasgow with success.

Osband's Summer, President Drouard, Easter Beurre, Souvenir de Congress, and Idaho have been swept away by the blight.

Plums.

Japan Varieties: Of these the Satsuma, Chabot, Wickson, Burbank, Ogon, Normands and Blood were almost a failure, while the Red June, Willard and Abundance gave a good crop.

Domestic Plums: The Bradshaw, Niagara, Yellow Egg, Imperial Gage, Lombard, and H. R. Purple Egg gave a full crop, while the Glass Seedling and Reine Claude were almost destitute of fruit. One of the Bradshaw trees (planted 1892) gave 13 eleven quart baskets.

In regard to the duration of life of different varieties the following may be of interest:

Of 600 trees planted in 1892 these varieties are still living and healthy: Bradshaw, Yellow Egg, Niagara, Glass, Hudson River Purple Egg, German Prune, Shipper's Pride. General Hand, and Munroe.

The following varieties have mostly died, but the fruit trees have been replaced: Imperial Gage, Reine Claude, Lombard, Purple Egg, Gueii, Yellow Gage, Italian Prune, *Prunus Simonii*.

Lombard Improved: Planted 1899, fruited for the first time. So far as I can see this plum cannot be distinguished from the ordinary Lombard in form, color, flavor, nor season. Possibly there is the same distinction as that between the Bradshaw and Niagara.

Prince of Wales: Planted 1896, plum; medium size; oblong-round; very showy and handsome; season, about same as Lombard; yield, 3 eleven quart baskets per tree.

Staunton: An upright, vigorous grower, which seems worthy of a place in a commercial orchard; fruit, medium size; blue; oblong-round; firm flesh of good quality; season, early October.

Shropshire Damson: Planted 1896, gave a heavy crop of plums of even shape and quality; size, small to medium; oblong round; dark purple of fine quality; season, late September.

German Prunes Are not very satisfactory here, they drop too readily.

Grapes.

Campbell's Early: Planted 1904, bunches fair size; moderately compact; grapes black of good quality; season, between the Moyer and Moore's Early.

The Worden appears to require more severe pruning than some of the other kinds, owing to the presence of small green grapes in the bunch. The vines upon which too many fruit-canes were left seemed to be the worst in that respect.

The Eaton grape, while it gives an exceptionally large purple berry, sometimes nearly an inch in diameter, has not borne well here.

The Salem and Catawba ripen too late many seasons in this district. The general crop of grapes was heavy, 3 acres giving 10 tons of grapes.

Currants.

The following is the station record and description of varieties planted more recently. The older varieties and their habits are fully described in previous reports:

Commercial List: Red: Cherry, Fay, North, Star Prince Albert, Victoria, Wilder. Black: Collin's Prolific, Lee, Naples, Saunders. White: Grape and Imperial.

YIELDS of Currants in quarts per bush. for years 1902-1907 inclusive, with average per year.

	1902.	1903.	1904.	1905.	1906.	1907.	Six years.	
							ctal.	Average per year.
*Baldwin				¼	1	½		
Belle d' St. Giles	2½	1½	1	1	2	2	10	1.67
*Black Victoria				½	1½	1		
*Boskop's Giant				1	1	1½		
†Brayley	3	4	2½	4	2	3½	19	3.17
*Beauty				½	1	2		
Champion	3	4	2	3	2	1	15	2.50
*Comet				½	1	3		
Cherry	4½	5½	4	5	3	4	26	4.33
Collins	2½	5½	4	4	3	2½	21½	3.58
Crandall	4	4½	5½	4	3	3½	24½	4.08
Fay	3½	4	2½	3½	1½	3	18	3.00
Lee	3	4	2½	3	1½	2½	16½	2.75
Naples	3	4½	3	4	3½	3	21	3.50
New Victoria	4½	5	5	5	3	5	27½	4.58
North Star	4½	5½	2½	4	2	5	23½	3.92
*Perfection				½	1	2		
Pomona	4½	4	3¼	4	3	4	22¾	3.79
Prince Albert	4	4½	4	5	3	4	24½	4.08
†Raby Castle	5	6	4	5	3	5	28	4.67
Red Cross	4	4½	3¼	2	1	3½	18½	3.04
†Red Dutch	6½	7½	4	3½	2	4	27½	4.58
Red Victoria	6	7	5	5	3	5	31	5.17
Saunders	3	5	4	4	2	2	20	3.33
*Standard				½	1½	1½		
*Success				1	1	1		
Versailles	3	4	3	2½	2	4	18½	3.08
White Grape	4	5	2½	3	2	3	19½	3.25
White Imperial	3	4	1½	1½	1	2	13	2.17
Wilder	4	5½	4	5	2½	5	26	4 33

* Planted recently.
† Rather small, and therefore discarded, yet they give a heavy yield.

BALDWIN: Planted 1903, fair grower; fruit medium size; black; sub-acid; season, medium; yield, one-half quart per bush.

BLACK VICTORIA: Planted 1903, vigorous grower; fruit large; black; sweet, sub-acid; season, early; yield, one quart per bush.

BOSKOP'S GIANT: Planted 1903, strong grower; currant black; large, sweet, sub-acid; season, early; yield, 1½ quarts per bush.

BEAUTY: Planted 1903, very strong grower; berry black; medium size; sweet, sub-acid; season, medium; yield, 2 quarts per bush.

CHAMPION: Planted 1904, moderate grower; fruit black; medium to large; sub-acid; season, medium to late; yield, one quart.

COMET: Planted 1903, medium grower; fruit red; sub-acid of medium size; season, medium; yield, 3 quarts per bush; foliage, light green.

PERFECTION: Planted 1903, moderate grower; berry red; medium size; sweet, sub-acid; season, early; yield, 2 quarts per bush; foliage dark green.

POMONA: Planted 1897, moderate grower, fruit-red; medium to large; flavor, sub-acid to sweet; season, medium; yield 4 quarts per bush; foliage, dark green.

PRINCE ALBERT: Planted 1897, strong grower; fruit, red; small to medium; very acid; season, late; yield 4 quarts; foliage dark green.

STANDARD: Planted 1903, strong grower; fruit, black; medium size; sub-acid; season, medium; yield 1½ quarts per bush.

SUCCESS: Planted 1903, moderate grower; fruit, black; medium size; sub-acid; season, medium; yield, 1½ quarts per bush.

WILDER: Planted 1896, moderate grower; currant red; medium to large; sub-acid; season, medium; yield, 5 quarts per bush; foliage, dark green.

BLACKBERRIES.

Varieties so injured by frost that there was no fruit. Dorchester, Early King, Early Harvest, Early Cluster, Gainor, Humboldt, Maxwell, Minnewaski, Ohmer, Wilson Junior.

Varieties somewhat injured by frost: Eldorado, Erie, Lovell's Best, Kittatinny, Wilson's Early, Wachusetts.

Hardy Varieties: Ancient Briton, Agawam, Stone's Hardy, Taylor, Western Triumph, Snyder.

Undesirable varieties would appear to include the first two lists.

Commercial List: Ancient Briton, Agawam, Snyder and Western Triumph. For the first time at this station Eldorado and Wachusetts were injured by the winter.

COMPARATIVE YIELDS OF BLACKBERRIES FOR YEARS 1903-1907 INCLUSIVE, WITH AVERAGE PER ROW OF EIGHTEEN FEET EACH YEAR.

	1903. Quarts per row.	1904. Quarts per row.	1905. Quarts per row.	1906. Quarts per row	1907. Quarts per row.	Five years' total.	Average per row per year.
Agawam	5	6	4	6	4½	25½	5 1/10
Ancient Briton	6	5	6	7½	6½	31	6½
Dorchester	½	.....	1½	1	.....	3	3/5
Early Cluster	1	.....	.....	1½	.....	2½	½
Early Harvest	4½	.....	.....	½	.....	5	1
Early King	3½	.....	.....	¾	.....	4¼	17/20
Eldorado	2	4½	3	4½	1½	15½	3 1/10
Erie	5	.....	3	5½	2	15½	3 1/10
Gainor	3½	.....	.....	½	.....	4	¾
*Humboldt	.....	.....	.....	4¾	.....	4¾	19/20
Kittatinny	4	.....	3	5	4	16	3½
Lovett's Best	3	.....	1½	2	1½	8	1⅗
Maxwell	1½	.....	.....	1	.....	2½	½
Minnewaski	1	.....	1½	1½	.....	4	⅘
Ohmer	3	.....	¾	1	.....	4¾	19/20
Snyder	6½	6	7	7	6¾	33¼	6 13/20
Stone's Hardy	4	3½	4½	4½	4	20½	4 1/10
Taylor	4	5¼	4½	5	3½	22¼	5 9/20
Wachusetts	1	2	1½	2	1	7½	1½
Western Triumph	5	6	6½	7	6	30½	6 1/10
Wilson's Early	2	.....	1½	1½	1	6	1⅕
Wilson's Junior	1½	.....	¾	1	.....	3¼	13/20

*Planted 1902.

LAKE HURON FRUIT EXPERIMENT STATION.

By A. E. Sherrington, Walkerton.

General Notes.

The winter of 1906-7 could not be considered an ideal one for the fruit grower in this district, owing to the mild warm weather of January and February, which started the fruit buds into growth, and then followed very cold, frosty weather with late spring frost, killing a large percentage of the buds of the raspberries and Japanese plums also the Duke and Bigarreau cherries.

The apple crop was a very good one in this district, but at the station the crop was rather light owing largely to the heavy crop of last year. In 1906 the yield from the five acre old orchard was between 700 and 800 barrels. This year the yield was 500 barrels.

Picking Cuthbert Raspberries at A. E. Sherrington's, Walkerton, Ont.

Clean cultivation is practiced on the whole of the farm. The apple, plum, cherry and pear orchards are cultivated frequently during the growing season, and a light coat of barnyard manure and wood ashes are applied once a year. We find this keeps up the vitality of the trees and gives us annual crops. The young Experimental Apple Orchard is doing very well and quite a number of the trees are coming into bearing but I find quite a number are not true to name, which is very dissappointing. No additional planting was done at the station last spring, except to fill in blanks where trees had been killed by frost or other causes.

No record of yield was kept this season, as I do not think this necessary for the reason it is impossible to keep a strict account of the yield of each variety.

Apples.

The apple crop, as stated above, was a very good one in this district, but lighter at the station than last year. A few of the newer varieties fruited for the first this season. Only a few varieties will be mentioned in these notes:—

Canada Baldwin: Tree upright; vigorous grower, ten years old; fruit medium to large; promising.

McIntosh: Tree spreading, vigorous and hardy; fruit large; commenced bearing at seven years of age.

Star: Tree only a medium grower; fruit large; color, greenish yellow; juicy, pleasant flavor; season, September and October; commenced bearing at eight years old.

Scarlet Pippin: Tree upright, spreading; fruit medium size; color, yellow striped and splashed with red; nine years old.

Stark: Tree vigorous, spreading, an early bearer; fruit uniform, medium to large; commences bearing at seven years; a very promising commercial apple. The apples shipped from this district will amount to fifty thousand barrels.

Blackberries.

The blackberry crop here was a total failure. The plants were nearly all killed out, but made a very good growth again this season. The varieties that have given the best results here are Agawam, Eldorado, and Snyder; but I cannot recommend the growing of blackberries in this district.

Red currants were a very fair crop, but blacks were very light. The demand for this class of fruit has been on the increase for the last two or three years. Out of some twenty varieties under test, the Cherry, Fay, Prince Albert and Red Cross among the red varieties, have given the best results. They are all large and the fruit of good quality.

The two varieties of black currants that have succeeded here are the Champion and Naples. They have given the largest yields and have proved hardy; fruit large and of good quality.

White currants are not in demand. The best varieties are White Grape and Imperial.

Cherries.

The Morello crop was good, but all of the Duke and Bigarreau class had the buds killed. The most profitable varieties for this district are, English Morello and Montmorency. Early Richmond is a good cherry, but the birds take the whole of the crop. Quite a number of the black varieties have been killed outright, and the most of these sorts will be removed and replaced with better sorts.

Gooseberries.

The gooseberry crop was a grand one this season, and the prices were also good. Downing and Pearl are grown for main crop and the yield from three hundred bushes was one hundred and fifty eleven quart baskets. These are American varieties, and are not subject to mildew. The English varieties did not mildew as badly this season as sometimes, but still enough to make them worthless for market. We have a number of other varieties that have not fruited as yet in sufficient quantities for me to be able to make any report on them.

Pears.

The pear crop was a fairly good one, but not much growth in the district. The orchard at the station has not done very well the last year or two.

The French pears planted in 1900 are not proving a success. They are very subject to blight. We have lost quite a number this season and none of them have borne much fruit as yet, only a few specimens of poor quality.

As stated in previous reports, I have top worked Kieffer stocks with some of the French varieties in hopes of getting a better tree and one that would perhaps come into bearing a little sooner, but I have been disappointed; for after making a good growth for one or two years, the Kieffer stock seems to either winter kill or die from some other cause. I have top worked a number of other varieties on Kieffers, with the same variety growing in the same row on its own stock, in order to see if any improvement will result.

The best varieties for this district are Clapp, Bartlett, Louise, Clairgeau.

Plums.

The plum crop at the station was very good this season. Such varieties that were not damaged by frost or had the buds killed last winter, gave large yields. Nearly all of the Japanese varieties have been killed out, and those that were not killed had the buds so badly damaged last winter that they scarcely leafed out. The varieties that gave the best yields and have withstood the hard winters are Bradshaw, Englebert, Field, Gueii, Imperial, Lombard, Pond's Seedling, Quackenboss and Yellow Egg. Saunders has proved to be quite hardy, also a large number of others. Gueii and Quackenboss yielded fifteen baskets per tree. The quality was good and all sold for good prices. Gueii, Quackenboss, Yellow Egg, Imperial, Grand Duke, Monarch, Arch Duke, Field, Englebert, Bradshaw and Lombard are among the most profitable sorts. Among the newer sorts that commenced to fruit this season are, Arch Duke, Giant Prune, and some others, but not in sufficient quantities to be able to give any report upon them.

Peaches.

The peach trees that were planted since the hard freeze have again been all killed out. Not one is left, and now they will stay out.

Raspberries.

Raspberries were almost a total failure here this season. Warm, mild weather during the winter months and then hard frosty nights later on, killed fifty per cent. of the buds; then the dry summer nearly completed the ruin. The old, experimental plot was broken up a year ago, so at present we have only three varieties of red raspberries—Marlboro', Herbert, and Cuthbert. These three are the only varieties that are worth cultivating. The Marlboro' ripens a few days before Herbert but the quality is not so good as Herbert. Herbert ripens a few days before Cuthbert, but is not so good in quality. The best yielders are, in the order named, Herbert, Cuthbert, Marlboro'; in quality it is Cuthbert, Herbert, Marlboro'. In ripening it is Marlboro', Herbert, Cuthbert.

A new plantation will be planted the coming spring, and these three varieties will comprise the commercial sorts.

Blackcaps have not been doing well for the last two or three years. The two most reliable varieties are Conrath and Hilborn, but Hilborn is much the best, as it is very hardy and the fruit is first-class.

Strawberries.

The strawberry crop was only a medium one this season, owing to the severe dry season. Our prices were good, making up for the low yields.

The varieties that have proved to be the most profitable at the station are Brandywine and Saunders. A number of other sorts are under test, but none has yielded equal to Brandywine. The demand for this berry has increased two-fold in the last two or three years. The quality is first-class, and its shipping qualities cannot be beaten, but it requires a good clay loam to do its best. It does not succeed on light or sandy soils.

Insects.

The Insect that caused the most loss to the fruit grower this season was the Codling Moth, and I do not think that it was ever known to be as bad. I think that twenty-five per cent. of the apple crop was destroyed by this insect, but it was found to be much worse in sod orchards than in cultivated ones, and also in orchards having rail fences or any rubbish lying around; even grass is a harbour for the Codling Moth. If orchards are kept clean, well pruned and sprayed, one will not be much troubled with the moth.

Other insects were not troublesome except the larva of the May Beetle. This insect has done a good deal of harm in the strawberry plantations. It also has caused considerable damage among potatoes the last year or two.

BAY OF QUINTE FRUIT EXPERIMENT STATION.

By W. H. Dempsey, Trenton.

Apples.

Many of the growers in this district white-washed their trees early last spring in the hope of killing the bark lice which were destroying many of their trees. Though too late in the season to be effective, it showed their increasing interest in bettering the greatest industry in this part of Ontario.

In spite of all this trouble the crop was not as good as it might have been had the season been otherwise. The season was very unusual, and the results as a whole are rather disappointing, as both quality and quantity have suffered from peculiarities of the season. In the first place the apple trees were three weeks later in coming into bloom than in other years. This, followed by unusually dry weather lasting until the picking season, was the cause of apples being but little more than half grown at the time when picking should have begun. The result was that in the rush of gathering it was necessary to pick undersized apples which should have had a longer time in which to mature. Had it not been for the drouth the crop would in all probability have been a very large one and mostly No. 1.

Insects and Fungi.

Though the insect pests were minor features compared with the effects of the drouth some were so severe that mention should be made of them. The Codling Moth was not so injurious as in '06. The Apple Maggot was present in considerable numbers this season damaging apples in some localities. Owing to the dry season, and absence of fog, the usual fungi were very scarce.

However, the Dry Rot, a disease new to my district, made its appearance this season causing great losses in some orchards, one orchard losing about

$1,200 through this alone. It is due to the lack of moisture in the soil, the trees becoming unable to support the growth, consequently the inner tissues break down causing the disease. As the decomposition spreads through the apple to the skin, the skin sinks, and gives it the appearance of being pitted. One feature of this disease is that affected fruit is very hard to detect in the early stages, and thus the fruit is liable to go into barrels for market which results in a loss, as the fruit will not stand up for shipment, causing slack barrels.

As the disease was a formidable enemy only in uncultivated orchards, its prevention is easy, it being only necessary to cultivate, and thus preserve the moisture for the trees in place of letting the clover or sod take it away. Another great lesson for us was given by the early frosts, which seem to point out that every grower should have the picking of his apples under his own control, thus avoiding danger of early frosts, and also being able to see that each variety is picked in its proper season and not picked until fit.

Bird's eye view of W. H. Dempsey's orchard and home, Trenton, Ont.

In Fruit Experiment Station Bulletin 147 a list of apples was recommended for this district, after ten or twelve years of testing. Reasons are here given for recommending the list:

Duchess: This is the best of the early apples and one which can be handled in both home and foreign markets.

Trenton: This variety because of its color, quality and good shipping qualities is recommended for commercial lists.

Gravenstein: Is a good bearer and carries well.

Alexander: A large apple; does well in old country markets, but is not a favorite in Canada though a good cooker.

Fameuse: Is not only good as to shipping qualities, but has qualities in flavor and texture which help to sell it anywhere, and notwithstanding the fact that it is subject to spot it is a profitable apple if cared for as it should be.

McIntosh Red: This apple promises to succeed the Snow. It is subject to spot and needs care, but it will produce well and sell well in home markets.

King: Though a shy bearer on some occasions and subject to sun scald, the King can by care be perhaps made to pay and pay well, as it usually gets a high price in any market.

R. I. Greening: Though this variety has a delicate tree it may be made, with a little of the proper care, into a paying variety. There is a good demand for Greenings, not only for ordinary cooking but also because it is one of the best pie making apples.

Baldwin: Though this year a little under size, this apple is one that makes good stock in markets for winter. It is adapted more especially to heavy land and here it will give best results, though it sometimes does very well on lighter lands. The trees are apt to freeze in very severe winters.

Seek: This apple is a good cropper, bright color in most cases and sells well, but should, like most other varieties, have good care and proper food. It is a good apple for early winter shipping.

Spy: This is an old standby; it will sell almost any time and anywhere owing to its superior quality. The trees are hardy and give very satisfactory results. The fruit, however, does not keep in a way that is always the same, some years it will stand long storing while in others it will not ship.

Tolman Sweet: This is the only sweet apple on the list and is the best of all sweet apples. It would not be wise to plant heavily of this variety.

Ben Davis: This is a great producer, producing apples at a very cheap rate per barrel. It has good color, keeps well late into the season, and carries well to foreign markets. It is better than the so-called substitutes which agents are selling, as Gano, for instance.

Stark bears well, but the fruit, while in other ways suited to markets, is dull in color compared with Ben Davis. It, however, stands storage and carries well if not held too long.

Primate is recommended for domestic use. The fruit ripening unevenly, is of good quality, and extends over considerable time. Thus it would be adapted for home use where a very large supply is not needed.

Promising New Varieties.

A few of the promising new varieties are:

Warren Pippin: A green apple ripening in September, it is uniform in size and carries well.

Coo's River: A red apple; bears every other season; good quality fall apple.

Golden White: A medium sized red striped apple, very pretty. As this is its first year to bear in quantity large enough to ship, it is hard to say just what it will do.

York Imperial promises to do well for a winter variety. It is uniform and hangs well; fair color.

To those who are thinking of planting, I would say that it is a wise plan to plant enough of a variety to insure getting a carload or nearly so, which ensures a more ready sale. It is also advisable to have apples covering the whole season, and so avoid the rush at picking time. Another good thing is to plant the best varieties, and not too many kinds, as this causes piece cars of fruit, and demands more skill in providing proper attention.

Pears.

Pears were a good crop; the weather conditions did not seem to have as serious an effect on them as on the apples.

Bartlett: Bore a large crop. The fruit was on an average smaller than other years.

White Doyenne: Bore well: the crop was uniform in size and sold readily.

GIFFARD: Was well loaded and was fit for market early. The fruit was of good quality.

HARDY: Also had a considerable load of pears, but they were not so large as last year.

GOODALE: Was very heavily loaded, the fruit perhaps a little undersize, but was very uniform.

KIEFFER: This variety though not of as good quality as the others loads well. If an attempt was made it is probable that these could be grown in large quantities for canning purposes and leave a good margin.

SIMCOE FRUIT EXPERIMENT STATION.

By G. C. CASTON, CRAIGHURST.

General Notes.

There was very little in the way of new stock received for planting. A few currants, including some new varieties, and some of the old, standard sorts and two trees of the seedless apple.

Home of G. C. Caston, Craighurst, Ont.

This year was a year of extreme drouth—the most severe in over forty years. Orchards in sod suffered severely, but those cultivated came through fairly well. The apple crop at one time did not look as if much of it would be fit to pack, but when the September rains came, they grew so rapidly that there was a fair crop of pretty good quality after all. The apples averaged smaller than usual and a larger percentage than usual had to be packed No. 2, but they were very clean and free from scale and other blemishes, so that No. 2 stock this year, except in size, was quite equal to the No. 1 of other years.

Pears did very well this year, though not grown extensively in this locality. Those who had a few year trees got a very fair crop. The varieties that seem to do best here are, Flemish Beauty, Bartlett, Clapp's Favorite, Louise Bonne and Kieffer. The latter ranks among pears as the Ben Davis among apples.

Small fruits, with the exception of strawberries, were a total failure. Raspberry and blackberry canes seemed to suffer from winterkilling, and the extreme summer drouth finished what the winter had begun. The fruiting canes bloomed well and set fruit, but dried up and died during summer. We will be under the necessity of laying down the canes in winter unless we can get something hardier than we have now.

Apples.

Top-Grafted Apples. For the last twenty years I have been advocating the top grafting of our best apples, and experience proves that I have been right. I am now getting results from top grafting done in former years, and invariably it is the top-grafted trees that give the best fruit. The Spy, the Baldwin, and the Greening can be grown successfully here, and are of the very best quality by this system. The King, I have reason to hope from results so far, may by this plan be made to produce paying crops, and the fruit is second to none grown anywhere else in Canada.

The question of the most suitable stock for the purpose is one that calls for further experiment and investigation by all experimental stations in Canada, for there is much yet to learn. The stock must be hardy and healthy, and of such habit of growth and texture of wood as will make a perfect and smooth union between stock and scion. One of the best so far tested for top working winter apples on, is the Tolman Sweet, although I have had good success with Spy worked on Yellow Transparent and a number of other Russian varieties. King is doing well on a number of the Russians, while the Russet, Astrachan, and Duchess are almost useless for the purpose. The latter, because of its slow wood growth, does not unite well. There are a number of other varieties that are not suitable, such as Wallbridge and a number of the Crabs. Experiments, observation and research along this line will be of undoubted value to apple growers.

Golden Russet: I would not for my own part plant Russets. If I got the trees as a gift, as I consider it a most unsatisfactory apple to grow. The tree is hardy, but not productive, and it is not wanted in the home market. On account of the size of the apple and its light bearing, it costs more to pick than any other. It has to go abroad to find a market, and altogether I consider it an unsatisfactory apple to grow.

Gano: This, like the Ben Davis, while a great bearer and a handsome apple, is only half hardy, and is proving susceptible to winter injury; so that those who wish to grow this apple in this locality would do well to top graft it.

Boiken: This variety is also showing signs of winter injury. It is the earliest bearer and most productive apple tested here. The fruit is bright and clean, and, though not of high quality, is one of the longest keepers.

Stark: This apple is proving an acquisition for this locality. The tree is quite hardy, quite productive and the fruit of fair quality. It is a good shipper. I have no hesitation in recommending this apple to intending planters.

Salome and the Russian apple Bogdandoff: These would do well probably for localities farther north, where they cannot grow the better

class of winter apples. I do not recommend them here for the reason that we can grow something better.

Canada Baldwin: This apple has fruited two years and seems to be a hardy, thrifty tree. The fruit is only medium in size, but is solid and firm; evidently a good keeper. The color is bright and attractive. This apple is worthy of further trial.

Fallawater: Large, clean smooth, attractive. It evidently will do well here. I have planted a large number of these in my new orchard.

Winter Maiden's Blush: Very good in both tree and fruit. Tree is healthy, hardy and thrifty. Fruit much larger than the fall variety of the same name and makes good its claim as a winter variety.

Wealthy: One of the most unsatisfactory fall apples in my estimation. I would not plant it or advise anyone else to do so, for several reasons. The first years of bearing, the fruit will be fair, but as the tree gets older, it overloads and will not mature half of its load. You get a few good ones out of the centre top of the tree, but the side limbs are loaded with a lot of small rubbish that never matures, and is unmarketable. As soon as any of the fruit approaches maturity, it falls off, and it is safe to say that not half the apples grown on Wealthy trees are ever marketed.

Yellow Transparent: While I would not recommend the planting of this on a large scale, yet for any one near a railway who can ship in baskets, it is a profitable kind for the purpose, as it is the first apple of all that is fit to cook. It is ready for that purpose long before Astrachan or Duchess.

Princess Louise: One of the very nicest Christmas dessert apples that I know of. The tree is thrifty and seems when of bearing age to be quite productive. The fruit is only medium in size, and is very susceptible to the fungous scab, so that it requires attention to the pruning and spraying of the tree. But, withal, it might be profitable to grow as a choice dessert apple.

McIntosh: This variety is somewhat erratic and irregular here. Like the Snow, it is subject to scab, and does not bear regularly. Some years, like the present, it will do wonderfully well. We had the finest McIntosh here this year I ever saw; but this only occurs once in two or three years, so it is doubtful if it is advisable to plant it largely here. Shiawassee Beauty would be more profitable, though not such a high class dessert apple as McIntosh; yet it is of the same origin and has a strong smack of the Fameuse flavor in it.

Baxter: This apple was remarkably fine this year, and, although like Fameuse and McIntosh it is very susceptible to fungus scab, yet if kept well pruned and sprayed, it is a profitable apple to grow here. It is a regular bearer. The fruit is large and highly colored. It has no claims to dessert quality. The flesh is a little coarse, but it is a first-rate cooking apple, and when free from scab and bright and clear as it was this year, it will always sell well in any market. Its season is October to February here.

From my experience so far, my selection for a commercial apple orchard would be, to cover the season: For extra early, a few trees of Yellow Transparent for basket shipments. Then Duchess, and for fall shipment, Alexander, Blenheim, Pippin and Wolf River; for late fall or early winter, Baxter; for Christmas dessert apples, Fameuse or Princess Louise, and a few trees of McIntosh.

For winter varieties, first and foremost, the Northern Spy. Fully half the orchard should be Spy; then Baldwin, King, and Greening, these four to be in all cases top grafted on Tolman sweet or other hardy stock. These

might be supplemented by a few other winter sorts that are hardy enough without top grafting. These would be Stark, Fallawater, Westfield, Seek no Further, and Pewaukee.

This would cover the season and would be enough of varieties. It is a common error to plant too many varieties.

A list of varieties of apples not considered worthy of further cultivation in Simcoe County:

Wallbridge, Sutton's Beauty, Barry, Cooper's Market, Haas or Fall Queen, Lubsk Queen, Anisim, Chenango, Gravenstein, Aiken's Red, Hamilton, Montreal Peach, Dominie, Fanny, Gideon, Star, York Imperial, Clayton, Yates' Red, Winesap, Fall Pippin, Keswick Codlin, Brockville Beauty, Primate, Jersey Sweet, Cranberry Pippin, Magog Red Streak, Longfield, Sherwood's Favorite, Blushed Colville.

Pears.

I have a small block of Clapp's Favorite which I bought from a nursery for Flemish Beauty for the purpose of top grafting, and when I found they were Clapp's, I let them grow as they were, and did not top graft them. These are now beginning to fruit and are quite satisfactory. The trees are quite healthy and hardy and have done better than any pear I have ever tested. This is a case wherein the nurseryman sending trees untrue to name has resulted in good, for I would not exchange this block of trees now for any variety of pear. I would have no hesitation in recomending this variety as one of the very best to plant here. True, it is early and a short keeper, but it is large, handsome, of good quality, sells well and at highest prices. They went off like hot cakes at 75 cents a basket this year.

I have been top working Flemish Beauty with Bartletts for several years, and although they have done fairly well, I would have done better to have used Clapp's instead, as it is far the best of the two here. Giffard is a failure here, and I am sorry that it is so, for it is a very nice dessert pear.

Idaho, Vermont Beauty and Dempsey are not suitable for this section, though perhaps they might do, top grafted.

Dwarf pears worked on quince roots are of no use here. I planted a small block of Dwarf Duchess a few years ago and they are all gone. The Russian Pears thrive and bear well, but the fruit is of such poor quality that they are not worth growing. I would not advise anyone here to grow them, when we can grow some of the very best kinds successfully. I have tried top working those Russians with rather poor success. They do well for a while, but soon fail. The union was not satisfactory.

Bosc: This pear was an utter failure here.

Kieffer: Does very well, but I would not waste good orchard land with them.

The outstanding feature in my experiment with pears is the good showing of Clapp's Favorite. I am more than pleased with it. That it is likely to continue is proved by a neighbor of mine who has a tree, planted many years ago, and off which he sold $12 worth of pears this year.

Plums.

The average life of a plum tree this far from the Great Lakes is very short. You may get a few crops of very fine fruit and then an unfavorable

winter will come along and finish most of them. Of a great many varieties tested here, both Japans and the European class, one stands out prominent surviving the rest. I got it under the name of Staunton, though it very much resembles Glass Seedling.

I have not seen any of the American varieties that are worth growing, though they have the merit of hardiness.

Cherries.

My experience with cherries goes to show that it will not pay to grow them as commercial orchard fruit in this locality. Farther to the northwest from here, 20 miles nearer the Georgian Bay the Dukes and Morellos will do fairly well, but the same is true of cherries as of plums; that they will never be profitable very far inland from the Great Lakes. For those who wish to grow a few for domestic use, probably the best selection would be Orel, Ostheim, Russian 207, E. Richmond, and perhaps Montmorency.

I have come to this conclusion after a fair and careful test of some forty varieties, mostly of the Morello class. It is to be regretted that the test of cherries has been disappointing, for the demand for them is so great that the supply is never equal to it.

Strawberries.

I tried a great number of varieties of strawberries and am as far as ever from the ideal or perfect berry. Perhaps we will never get it. The best all around berry for the past few years is the Williams, though it has the fault of the white tip; yet it is one of the best here since the passing of the old Wilson's Albany which in its day came the nearest to perfection of any ever grown here. The most productive variety has been the Crescent, but it was rather acid, lacking in quality and rather soft. It is still productive, but it is running out, as it has been a long time in cultivation.

I have now under test Dunlop, Glen Mary, Miller, Tennessee Prolific, Wm. Belt, and Three W's. I have also some seedlings of my own, among which I expect to have some better than many of the varieties now in cultivation.

Raspberries.

Raspberries were a total failure this year. Cuthberts are the principal variety planted, and they always suffer more or less from winter injury, but this year the drouth finished what the winter began, and a failure was the result, although the crop was well and regularly cultivated and fertilized.

It has been suggested to lay down the canes for winter. I am going to try the experiment with blackberries, but I hope to have a variety of raspberry that won't need it, and I expect we will find it in the Herbert, of which I succeeded in getting a stock of plants last spring. These have made a most satisfactory growth, and if all that is said of the Herbert as to hardiness is true, it will be just what we need here.

Eaton: A new variety from Michigan which fruited this year. I had but a dozen plants, and though the drouth was severe, they produced some very fine fruit. The flavor of the berry is not of the best, being rather acid, but, the fruit is large and handsome and the canes seem quite hardy so far.

Louden is a nice berry, but the canes are not vigorous and are slow of propagation. The same may be said of the Miller and I think neither of these would be satisfactory for a commercial plantation.

Blackberries.

I have this year under test the Gainor and a new variety, the Mercereau, for which considerable merit is claimed. If we can get a blackberry of as good quality as Eldorado and hardy enough to stand a temperature of 25 degrees below without injury to the canes, it would be a great acquisition.

The blackberry crop was a failure this year. Winter injury to canes and severe drouth of summer following made the failure complete.

GEORGIAN BAY FRUIT EXPERIMENT STATION.

By J. G. Mitchell, Clarksburg.

It is not intended in this report to give detailed descriptions of individual varieties, (as this work is now well covered by the "Fruits of

Experimental plum orchard at John Mitchell's, Clarksburg. Trees four years planted. Intercropped with sugar beets.

Ontario"), but to give general desired information for the benefit of planters, the Georgian Bay district in particular. Although the growing of plums forms a very important branch of our horticulture, and there is no place I know of where plums can be grown to greater perfection or advantage than in this district; yet now they are only a side show as compared to the great business that is being developed here in the production of commercial apples for export.

Plums.

This fruit being my specialty for experiment, will deal with them first.

Although the season of 1907 was extremely dry, yet we had a magnificent crop, by which we gained much conclusive evidence of the correctness of previous reports, and many object lessons.

From observation and extensive investigation of the requirements of the markets, also the various ways in which plums are used, we find the great buying public are now, more than ever, demanding quality, and rightly too. When people pay good money they should certainly receive value. Our canning factories require great quantities of plums if they can procure the right kinds, otherwise they don't want them at all. Yellow plums are in more demand than dark colored varieties, and are also, generally speaking, of better quality.

The only plums to fill the requirements are a few of the well tested European varieties. The following will pretty well cover the season; they have all been well tested here and are the very best of our nearly two hundred varieties of well tested plums: Washington, Imperial Gage, Bradshaw, Lombard, Quackenboss or Glass, Prune d'Agen, Arch Duke, Yellow Egg, Coe's Golden Drop and Reine Claude. To these might be added Red June, a Japan, on account of its earliness. This is the only Japan plum that I would plant in a commercial orchard. It is the first plum to ripen.

Japan Plums. Although quite hardy, rapid growers, and abundant bearers of beautiful fruit, they have been the most disappointing.. Their quality is so poor they spoil the sale of better plums. There are few who buy Japan plums who want plums of any kind for some time to come. We have given all the leading varieties of Japan plums a thorough test, and in my opinion these plums have done more to make plum growing unprofitable than all other factors combined.

To those who would still plant Japan plums the following are the best: Red June, Burbank, Satsuma and Chabot. These cover the season in the order named. They are all quite hardy.

American or Native Plums. Out of all our extensive list, and I think we have the best of them, there is not one variety, of this class of plum which I could recommend. They are of no use in the best plum sections only an incumbrance to the ground; with us unsaleable and never made a dollar. Stoddard, Wild Goose, Milton, Cheney, Forest Rose, Forest Garden, Wolf, Weaver, Chas. Downing, Pottawatomie, and Whitaker are about the best. In quality, they are about the same as wild plums, the only differences being in size, color, and time of ripening.

Cultivation. Plums require the same generous care, cultivation and fertility as any other fruit crop. None will respond more quickly or give better returns for the time and money invested than plums. It is useless to try to grow good plums without thorough cultivation. To conserve moisture, which plums greatly need in their growing season, cultivation should begin in the spring as soon as the ground is in good working condition and continue until July, when cover crops should be sown. When conditions are suitable we prefer clover, and have had some very fine stands, when sown about the first of July. If not suitable for clover sow peas, oats, barley or rye. I would rather have the ground covered with a big crop of weeds than nothing at all.

This will apply to apples as well as plums. I had ample evidence of this last summer and many object lessons. When driving about the country, one could tell the cultivated orchards by their foliage, quite a distance away, and there, invariably was where the best fruit was found. Not only that, but usually from two to three times as much of it, with from fifty to seventy-five per cent. No. 1, while in the neglected orchards there was very few No. 1 to be gathered. In the face of the fact that No. 1 apples sell from one to two dollars per barrel more than the No. 2, this is surely an object lesson worth remembering. Fruit trees must be well fed and

cared for. This will apply to all kinds of fruit. We cannot grow high quality fruit without good feeding and care, any more than we could raise good animals.

Insects and Diseases. Codling Moth did more damage than anything else. In some unsprayed orchards fifty per cent. was ruined, while in orchards well sprayed and cared for, there were very few wormy apples. This is another object lesson.

Apples.

During the last few years a great forward move has taken place in the production and sale of commercial apples. This is largely the result of information and experience gained through the experiment stations in this district.

Growers have organized themselves into a strong co-operative company, known as The Georgian Bay Fruit Growers, Limited, incorporated under the Ontario Companies' Act, and having a list of nearly three hundred stockholders and patrons. They have already built and operate two of the best apple storage buildings in Canada, one at Thornbury, and the other at Meaford. Each has a capacity of ten thousand barrels. With the practical test of fifty varieties on the station grounds, and the handling and selling of about one hundred and twenty varieties through the Fruit Company, it gives us a great opportunity to determine values.

Out of all this long list, and this includes nearly all the recommended new varieties, only a small percentage are the money makers. Basing the value of apples at one dollar per barrel, and this is the average price paid by the buyers in Ontario, ninety per cent. make no money over and above expenses. This may seem a little overdrawn; such is not the case, but cold facts, the result of several years' experience with actual sales on the foreign and home markets. This should not be, if planters selected the varieties wanted by the trade, and for which they are usually ready to pay a good price, for from fifty to seventy-five per cent. more would be made by the same investment, than if a large number of indiscriminate varieties were planted.

The following are a good list and do exceedingly well in the Georgian Bay district: Duchess, Gravenstein, King, R. I. Greening, Baldwin, Spy, Golden Russet and Mann. The two last named require deep rich soil.

Pears.

There is no difficulty in growing all the leading varieties of pears here. We find them to succeed quite as well as apples. In the recently set trees we have nothing to report only good growth. The older trees are giving a good account of themselves. The following are the cream of the list; no one wanting pears need have any hesitation in planting them, at least for a depth of several miles back from the water front all the way along the south shore of the Georgian Bay: Bartlett, Duchess, Clapp, Flemish, Anjou, Howell, Louise, Lucrative, Clairgeau, Goodale, Bartlett, Seckel, Kieffer.

Cherries.

We had a fine crop of cherries this season, nearly all varieties fruiting. For profit, Montmorency easily leads them all. Windsor produced a very

nice crop, but were mostly gathered by the birds. May Duke, had a very pretty crop of excellent cherries. Olivet succeeds wonderfully well some seasons, but other is rather shy. It is always a good seller. Ostheim is very hardy, branches slender and rather straggling grower, fruit medium size, color dark and red. Yellow Spanish is scarcely hardy enough for here. Some winters the buds are injured by frost. It occasionally does very well.

In my experience, Montmorency, May Duke, Olivet, Early Richmond, Black Tartarian, and what are known here as common Red and Black are the best bearers, and scarcely ever fail.

Grapes.

Enough has been done to show that grapes can be successfully grown here, yet we would not advise the planting in large quantities. The Niagara district being about ten days in advance, they have the market so much earlier, there is no use in growing only for home use.

Champion, Green Mountain, Diamond, Niagara, Brighton, Delaware, Salem, Vergennes, Pocklington, and Worden, we grow and ripen. These are all quite hardy and very little trouble to raise.

Berries, Currants and Gooseberries.

I do not know of any one here who makes a business of growing small fruits for market, and there are few places where they could be grown to better advantage. The deep snow in winter gives ample protection, and there is no such thing as failure. All the leading varieties of small fruits grow to perfection with the least possible trouble.

ST. LAWRENCE FRUIT STATION.

By Harold Jones, Maitland.

Character of the Season.

The winter of 1906-7 was normal in this section and favorable for fruit trees in general. There was a fair covering of snow which laid evenly on the land, and frost did not penetrate to any great depth. Winter actually set in on December 1st, one day later than the previous year, when ploughing was stopped, the temperature going down to 1 degree Fahrenheit with a light covering of half an inch of snow, which gradually increased in depth to 5½ inches by December 29th, which depth was practically maintained all winter up to March 11th.

January 20th was the coldest day of the season, the thermometer falling 20 degrees below zero.

April was cold with frequent showers, fruit buds remaining perfectly dormant.

May was cold, cloudy and dry, which did not advance vegetation.

During the month of June we had favorable growing weather. Cherries were in full bloom by June 5th. Fameuse in full bloom on June 8th, 20 days later than normal.

Cherries, Pears and apples came through without injury, but plum trees suffered in fruit bud. Strawberries wintered well, and gave good crops where well mulched, but were a failure where the ground was bare and hard, lacking in humus.

Currants of all kinds were a full crop. Gooseberries were a full crop with no mildew. Raspberries were severely injured and the crop a failure.

Insects.

Insects were not numerous. The Codling Moth was kept well under control by thorough spraying just as the blossoms fell. Red-humped Caterpillar and Fall Webworm appeared in some numbers but did not do material damage. The Tussock Moth was not so much in evidence as in former years and did very little damage.

Spot fungus was kept well under control by three sprayings, but in orchards unsprayed a considerable percentage of the fruit was affected.

Apples.

My notes on varieties published in the reports of 1904, 1905, and 1906, require very little correcting. I append the folowing notes on varieties that have not been completelv reported as yet.

Blunt: Planted 1897; a round, compact vigorous tree; hardy; ripening its wood well; fruit large, 3 to 3½ inches; yellow, striped and splashed with red; a nice looking apple. This tree is very slow to come into bearing. In 1906, I harvested three or four specimens, and about the same number this year. It needs further trial to prove its value.

Boiken: Planted 1897. Tree suffering to some extent with sun scald and blight, not a very vigorous grower; indications are that it will die out in a few years; not a safe variety to plant.

Chenango: Tree planted in 1896. Comes into bearing four or five years after planting. A desirable dessert apple for September, but has not shown vigor. All three trees died this summer after coming into full leaf; although they were well protected by snow during the winter previous.

Excelsior Crab: Planted 1897. Tree hardy vigorous and very prolific; fruit hanging to the tree well: more like an apple than a crab but has some characteristics of a crab; similar in many respects to Switzer, though somewhat smaller in size; should give good results and be of value to northern sections.

Gano: Planted to some extent in 1900. Tree is proving somewhat hardier than Ben Davis; fruit medium, of a brilliant dark red with long keeping qualities; promises to be of value for the section as a late winter apple.

Langford Beauty: Planted in 1897. Trees not true to name as sent me, but from what I have seen of this variety it is worthy of trial, as it can well fill a place in the market following Astrachan which does not grow to the same perfection as the same fruit in the western part of the Province.

Mammoth Black Twig: Top grafted 1900, a hardy, vigorous tree, prolific, holding its fruit well, worth further trial.

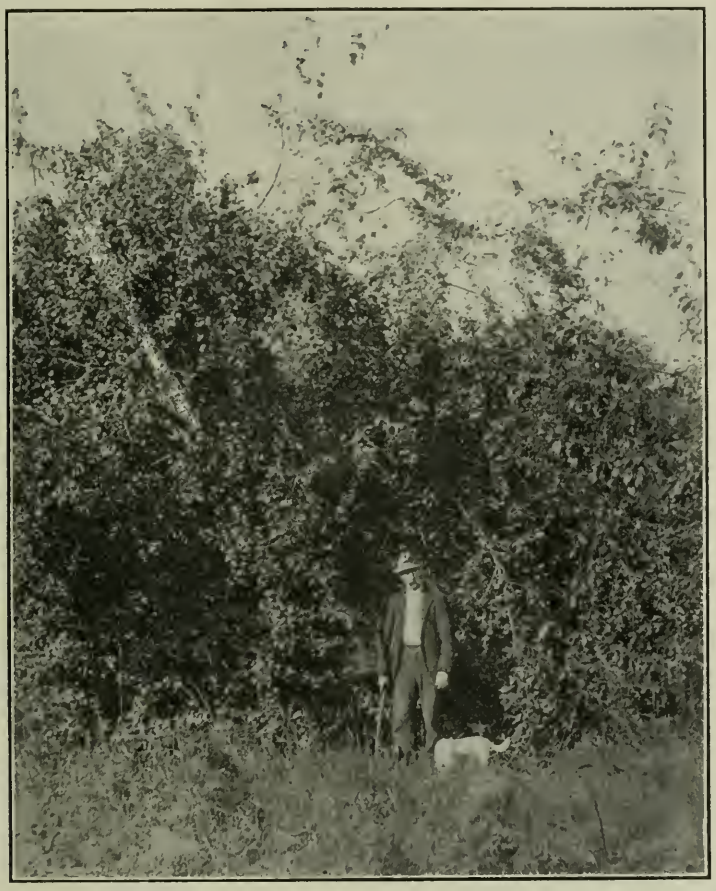
Palouse: Planted 1897, tree lacks vigor and is suffering from sun scald and canker, not desirable, no fruit.

Parlin's Beauty: Planted 1898, tree vigorous and hardy, forming a close compact head, fruit large and handsome, comes into bearing slowly but is worth further trial.

Rome Beauty: Planted 1898. Tree healthy and vigorous; fruit large and attractive; comes into bearing slowly; worthy of further trial.

Shiawassee: Top grafted 1904. A slender vigorous grower, hardy to the tips; fruit somewhat larger than Fameuse and more oblate; not so subject to spot; flavor of good character. Evidently of Fameuse type, and well worthy of extended trial.

Sutton's Beauty: Planted 1896. A weak growing tree subject to canker and sun scald; dying off from year to year. Not desirable and not hardy.



The best Fameuse apple tree in the orchard of Mr. Harold Jones, Maitland, Ont., from which he is selecting scions to top work all the trees in his new orchard.

Scarlet Cranberry: A slow, weak grower, subject to sun scald and canker. Not desirable.

Windsor Chief: Planted 1896. At one time this variety gave promise of being a valuable winter apple for the province of Quebec, but in 1903-4 the trees were nearly all killed in that Province. The three trees I have planted have shown moderate vigor, and are keeping fairly healthy, but slow to come into bearing. Worthy of further trial on account of its value as a winter apple.

Wismer Dessert: Top grafted 1901. Vigorous, fairly hardy, showing some canker at the crotch of the main limbs; fruit $2\frac{1}{2}$ to $2\frac{3}{4}$; attractive;

quality first class; a promising variety; season December to February 1st, after which date it begins to break down and lose character. Promising.

The only two profitable late winter apples that we have at present are the Scott Winter and Milwaukee, which two varieties are, properly speaking, only cooking varieties.

It is my desire to conduct a test on some of the best crosses made by Mr. Macoun between the McIntosh and Lawver, Swazie Pomme Grise and Scott Winter, and possibly other crosses, hoping to live to see a profitable, valuable winter apple grown in the St. Lawrence Valley.

Golden Russet and Yellow Bellflower: Are the two best late winter apples we have for dessert purposes but are not profitable varieties to grow owing to lack of productiveness. If we could get an apple with some color and the quality of Bellflower it would be a bonanza for the St. Lawrence Valley.

Pears.

Thirty-nine varieties of pears have been tested, most of them proving too tender for this climate.

Flemish Beauty has proved fairly hardy, giving fair crops of good fruit. For the best results it should be grown in sod and mulched, when grown under high cultivation the tree suffers from blight and sun scald, but in sod it is quite free from these diseases. The fruit is subject to spot which can be controlled by careful spraying.

Clapp's Favorite is not quite so hardy as Flemish, but gave fairly good results in favorable seasons. The fruit bud is tender, and is often destroyed during the quick changes of temperature during March and April. The tree is short lived here, dying off gradually from sun scald and blight, and cannot be depended upon to live more than ten years.

Ritson is quite as hardy as Flemish Beauty in tree, but not quite so hardy in fruit bud; will give fair results on a northern exposure.

These three varieties in favorable seasons will give the grower fruit from August to November.

Bessemianka and Victoria are two Russian pears very hardy, but the fruit is of such poor quality that it is not advisable to plant them, except as a stock to top graft on.

The three pears mentioned above are not by any means ironclads, in fact the trees of all three varieties are dying off at from six to ten years of age and have to be replanted frequently to keep the varieties on record.

I have a pear here that has been giving annual crops for more than one hundred years on this old homestead. The fruit is similar in shape to Giffard, color bright yellow, flesh yellowish white, texture fine, somewhat dry, flavor very mild sub-acid, quality, first class for cooking; value first class for home market being in demand in preference to any pears on the market for cooking purposes. I have never sold for less than 40 cents per basket and often 60 cents. Consumers who know the pear will have nothing else for perserving if I can supply the orders.

As this pear is an annual bearer, and has proved to be as hardy as the Fameuse apple in this section, I have thought that possibly the quality of the pear might be improved by hybridizing with seeming hardy varieties such as Flemish, Clapp's and Clairgeau. The result of such crosses may lead to the production of a valuable hardy pear, that could be grown with satisfaction and profit in the St. Lawrence Valley.

I mention this pear particularly on account of its fineness of texture and hardiness, as it may lead to growing a very desirable fruit over a very much larger extent of Ontario than at present.

The tree has been propagated by suckers and distributed in this immediate vicinity.

Cherries.

The cherry crop has been more satisfactory this season than for many years past. The trees were free from aphis and the rot did not show. Orel, Montmorency and E. Morello were the heaviest croppers.

Orel has proved to be the hardiest in fruit bud of any variety yet tested, but is not equal in size or quality to Montmorency or E. Morello. The trees bore a full crop this year.

Montmorency gave a full crop of beautiful fruit. The tree is proving quite hardy, but the fruit buds are too tender to expect an annual crop with any degree of certainty.

English Morello gave a full crop. Tree healthy and vigorous; fruit buds hardier than Montmorency, but suffer from extremes of temperature in March and April.

Early Richmond gave a fair crop tree not quite so vigorous as E. Morello but seems quite as hardy.

Ostheim: A hardy vigorous tree but a very shy bearer with me. It has never borne a full crop of fruit even in favorable years when less hardy varieties are loaded heavily.

Olivet is both tender in wood and fruit bud, and should be classed as undesirable.

May Duke: Tender in bud, undesirable.

Vladimir: Hardy, but a shy bearer and undesirable, on account of its poor size and quality.

Orel, E. Morello, Montmorency, Early Richmond are desirable varieties to plant with a reasonable expectation of securing a crop in favorable years.

Plums.

The Japan plums under test are practically all gone. Red June, Ogon and Maru have lived for some years, but never gave more than a few specimens.

In European varieties I have Glass Seedling and Dunlop's No. 53 and 54 in a healthy vigorous condition, but they have not fruited yet.

Of the several varieties of Americanas sent me for planting the Hammer has proved the most prolific and hardy. Many of the varieties sent me were not true to name and proved in many cases less valuable than fence corner varieties.

After testing almost sixty varieties of plums of European origin and finding nearly all of them tender in wood and bud, our main dependence, (for the present, at least) must be on the Americana and Nigra plums.

Of this class some very desirable varieties are being grown, and it is my present intention to proceed with the testing of the Seedling European plums originated on the Island of Montreal and to test thoroughly the merits of the best of the Americanas.

Gooseberries.

The gooseberry crop was everything that could be desired this year.

Downing gave a full crop but the fruit ran a little small.

Golden Prolific: A moderate bearer, but fruit of very large size and fine quality; a very desirable variety to plant, no mildew.

Champion: A vigorous grower and heavy yielder, fruit no larger than Downing, but easier harvested; a desirable variety.

Houghton: A vigorous grower and heavy yielder, but too small.

Whitesmith: Does not succeed well with me; fruit does not come to maturity; in size or flavor not to be compared with Golden Prolific.

Currants.

Cherry: One of the most desirable currants in cultivation, a strong grower and productive, easily harvested and sells well on the market.

Fay: A moderate grower, with weak wood that breaks down badly with the snow, the berry is large, but the bunch is not as long as cherry. It has not been a profitable currant with me.

Pomona: Moderately vigorous, growing a very thick bush that requires severe pruning annually to bring the fruit to size; quality good.

Prince Albert: A strong, upright bush, with dark, large foliage; subject to attack by aphis; fairly productive; fruit very acid; season late.

Raby Castle and Versaillaise very productive, but fruit is too small.

Black Victoria: A strong, vigorous grower, fruit large and sweet; crop only medium in quantity.

Lee's Prolific: A moderately strong grower and fairly productive, a desirable variety.

Naples: An old standard that holds its own against all comers.

Raspberries.

Columbia, Conrath, Cumberland and Turner have proved too tender for this climate without winter protection.

Older: Has proved hardier, and gives a fair yield, but it has the bad habit of sprawling all over the ground, which makes it hard to manage.

Herbert: Planted 1906; came through last winter without any injury, and had a little fruit this summer. Possibly this variety will fill a long felt want in this section.

ALGOMA FRUIT EXPERIMENT STATION.

By Chas. Young, Richard's Landing.

The season of 1907 has been in many respects a peculiar one. Early in March there was every appearance of spring; a bright, warm sun during the day with the thermometer going well up to 70°. This continued for about two weeks. Buds were showing green on the fruit trees. This was followed in April by a hard frost, thermometer down to zero one night, finishing up with a snow storm on the 27th of May. Taken all together, the spring was very backward, the worst I have experienced in twenty-five years. This, together with the poor vitality of many of the orchards since the winter of 1903-04, has been the cause of more loss of fruit trees in this district than ever occurred in any one year before.

Cherry trees suffered more severely than any other fruit trees. Perhaps three-quarters are entirely killed, at least down to the ground level. Sun scald played havoc with the apples and pears; protecting the trunk only protected that portion of the tree; the top, in many instances was killed. I

notice that orchards protected on the north and west and fully exposed to the sun or on a southern slope, suffered most, while those with a full north or northwestern exposure, especially if on high land, were comparatively uninjured. Many varieties of apples that have been successfully grown for years, are now nearly all gone. Such kinds as Mann, Tolman, Golden Russet, Ontario, Wagener, etc., have just proved a little too tender. Still, with the exception of Ontario, those mentioned have been grown successfully to my knowledge for twenty or more years, and if more attention is given to site, low heads, and trunk protection for some years, I do not see any reason why they may not be tried again, as they are all winter varieties, and we have nothing, so far, to fill their place. Many new varieties are being tested at this station that are not yet in bearing; but, so far, they promise to be hardy, as far as the tree is concerned.

I would caution any grower north or west of the Georgian Bay to carefully disobey the repeated advice given by good authorities to top graft on Tolman stock. This may be, and undoubtedly is, sound advice to those living two or three hundred miles to the south of us, but the Tolman is not sufficiently hardy here, while Longfield I have found to be good. I have lost several trees this way; and when we find the top sound and the Tolman stock killed, it is sufficient proof that that stock was not hardy enough. While I do not believe that any stock will impart an extra hardiness, that is, so far as its frost-resisting power of the scion is concerned, still it is not only desirable, but imperative that the stock should be as far as possible able to resist extreme, low temperature in winter, and the bright warm days in spring followed by sharp frost at night.

Of fall apples we have enough and to spare, and think it would not be advisable to multiply them any more. It would be very hard to find an apple to take the place of Yellow Transparent, Charlamoff, Duchess, and Wealthy. These, I believe, we grow to better perfection than in the more favored districts, and they give us fruit from the beginning of September until the beginning of April.

There is an apple I would mention which has always done well with me, *viz.*, White Astrachan. I have never recommended this apple, perhaps for the reason that Thomas, in the "American Fruit Culturist," classes it as rather dry and of little value. All the same, the original trees, which I planted twenty-five years ago, all lived, and this apple has brought me more money and filled more barrels per tree than any other, excepting perhaps the Duchess. It has just one fault; the fruit has to be carefully handled.

I think our nurserymen should propagate more of the Charlamoff for the far north. It is the very hardiest apple I know, and although its season is short, it will thrive under almost any circumstances, and a measure of success with a beginner will lead to more extensive planting later on.

All soils are not alike suitable for fruit growing. Much of the land in the newer portion of Ontario consists of flat, stiff clay, impervious to water. This is to be avoided if possible. As a rule land on which maple and basswood grow, will be found well adapted for this purpose. On the other hand, that timbered with spruce and balsam will be found unsuitable, although after a few years in grain crop and exposure to sun and well ridged up, a fair measure of success may be attained. The best and thriftiest orchards I know of are upon soil somewhat inclined to gravel with a porous clay subsoil and a northern exposure. This is imperative on ground elevated above the rest of the field. I have a case in my mind of a rather extensive orchard planted on low rich ground, well protected on all sides. It has been carefully cultivated for some years, well protected from cold winds, well

manured, and the result a failure. Not ten per cent. of the trees originally planted are alive and healthy, while further along the road, another, planted on a hillside and not getting as much care, is very promising, and it is also noticeable that the further up the hill, the better the trees look.

Chas. Young's experimental apple orchard at Richard's Landing, St. Joseph Island, Algoma.

"Plant stock grown in your locality" may be a very good principle to go by, but I would caution those buying stock grown in the north that for some years past a large proportion has black heart, and unless one can make a personal selection in the nursery, or have the privilege of examination when delivered, I would prefer that grown in the southern part of Ontario. Certainly northern stock would be preferable if healthy, for it is usually better rooted. Twenty-five years' experience has taught us that trees as sent out are usually headed far too high, at least for the north, and I would strongly recommend to those who contemplate planting extensively to set out two-year old trees and form the head, say two feet or less from the ground, unless of a spreading habit, such as Longfield among apples or Burbank among plums, which may be of the usual height.

Winter protection of the trunk and lower portion of the top is necessary for some years. I find the advice to use a thin veneer of little use. The veneer, at most, protects only the trunk and leaves the collar exposed, and this is the vital part of the tree. If not very severely scalded the trunk will get all right again; but, if the collar of the tree is injured to the same extent, the tree is killed unless a new head is formed below the injured portion. I have tried many different protectors, such as barrel staves, basswood bark, building paper, etc., but have found nothing more effective than a strip of burlap or any old sacking wound round the trunk and lower portion of the top. This entails a good deal of work when there are many trees to go over, and a simpler and possibly just as effective a method is to make up some lime whitewash, have it about the consistency of plasterer's putty, when

it is run off. Throw a handful or two of fine sand or wood ashes into the pail, stir it up and apply with an old broom or whitewash brush, lay it on good and thick about the collar of the tree. I have found this a perfect protection from sun scald, besides being of benefit to the tree otherwise.

Now, a word as to the debatable question of cultivation. After the orchard has been in bearing for many years I have paid careful attention to this, and at last I have come to the conclusion that so far as we are concerned in Algoma, an orchard in bearing, seeded down with clover, will produce more and better fruit and with much less work than if cultivated. We do not need surface cultivation here to conserve the moisture. We have usually enough of that and to spare.

In an apple orchard I would prefer, when trees come into bearing, to seed down with clover. This will last for many years and when June grass begins to crowd the clover out, break up and seed down again.

Does Fruit Growing Pay in Algoma?

Now, to sum up the question, I answer without any hesitation,—Yes; and better than any other soil production. I have had some experience in Eastern Ontario, and a good many years in Algoma, and can affirm that small fruits and apples pay well, better even than farther east. The price we can obtain, (many thanks to the excessive charges of the transportation company) are much better than in the Toronto markets. In addition to the advantage of selling largely direct to the consumer, our summer and fall fruits have better keeping qualities and are of a higher flavor than those grown in the southern countries. If money is the sole object, pears, plums, and grapes had better be left alone, at least in the meantime.

Now, to sum up with a few general remarks. First as to location: Select if at all possible, a site for the orchard elevated above the surrounding part of the field, and naturally dry or underdrained. Light sand or stiff clay is to be avoided, although by careful handling the clay may be made all right. A slope ranging from east to west is desirable, but I would avoid a southern slope unless it faces a large body of water. Protection from wind, etc., is desirable, but I would prefer it fifty yards away. See that the stock is healthy and well supplied with fibrous root growth. Plant two year old stock, and, as a general rule, bed low. Give clean cultivation until bearing. Do not prune quite so close as is thought necessary farther south; 30 feet between the rows and 25 feet in the row will be found to be about right. Do not fail to protect the trunk and lower portion of the branches from sun scald and avoid extensive manuring.

Apples.

Fairly good success has been had with the hardiest varieties in this district, and a noticeable advancement has been made during the last five years. Formerly not enough apples were grown for home use. Now during the months of September and October they are largely exported to Sault Ste. Marie and other points by daily boat, giving excellent service at one-half the rate charged by rail. Fall and early winter varieties are mostly grown, Duchess, North Star, Alexander, etc., principally. Crab apples this year have been an enormous crop and of excellent quality and appearance. There is no use in eastern growers sending crab apples here, as we can grow them to far better perfection than they can. The same may be said regard-

ing summer and fall fruit, only in these we do not yet grow enough to supply the demand, although home grown Duchess or Alexander will bring 50c. a barrel more than those imported, principally on account of their better keeping qualities.

Our market here calls for a rather large apple, such as Wolf River. This will sell in preference to McIntosh, and other apples of better quality, but one which I hesitate to recommend on account of its tendency to scab. It is only in late years that this has given any trouble; but this fungus is gradually getting worse, especially in the Snow class, and in order to obtain clean fruit now we must spray at least twice a season, or oftener with Snows. Codling worm has not troubled us yet, but oyster shell bark lice are bad and getting worse, through neglecting the trees. We have nothing yet to take the place of your finer winter varieties, such as Spy, King, etc.; that is, nothing hardy enough to be depended on. Several are under test, such as Milwaukee and others from which we may obtain what we are looking for, an apple that will keep into spring.

Scott Winter, from which we expected better results, will have to be put into the undesirable class. The fruit with us runs too small in size after the tree is into full bearing. It is not productive and for a late winter apple will not compete with an eastern grown Spy, besides the tree is not altogether hardy. You will see that most of our apples, partake,—if I may use the expression,— largely of Russian blood, and all have one noticeable defect, that of dropping their fruit when nearly ripe. This, which in the old apple districts would be a serious fault, cuts very little figure here, as by keeping the orchard in grass and gathering the fallen fruit regularly, we can always dispose of it at the same price.

For varieties recommended see page 94.

A list of varieties of apples not considered worth further cultivation in the district represented by the Algoma Fruit Station: Spy, King, Baldwin, Tolman, Blenheim Orange, Rolf, Sweet Bough, Ben Davis, Stark, Bismarck, Mann, Rhode Island Greening, Fourth of July, Early Harvest, Lady.

Cherries.

This has been a hard year on cherries. I have always considered that a rather light, sandy soil was best adapted for this fruit. My first trees I planted on just such soil and but few healthy trees remain, while those planted on rather stiff, red clay are practically all healthy and carry a fairly good crop. This year has been the poorest on record, which is to be accounted for by the unfavorable spring. If we can keep the trees, alive, we can always count on a fair to good crop of cherries within a limited distance of lake influence. I don't think we will ever see the magnificent specimens of trees to be met with in parts of Old Ontario. All I have seen bear evidence of early decay, nevertheless, if grown near any large body of water, cherries are a paying crop. I can see no difference in the hardiness of the different varieties. Orel and Montmorency are perhaps the best two I have grown, but Richmond, Montmorency and English Morello will fill out in season. It is little use trying sweet cherries; under the most favorable conditions it will only result in failure. The difficulty is the bursting of the bark on the trunk of the tree. This may be obviated by heading the trees nearer the ground. No black knot so far has troubled us. I have never protected the trunk of the trees during winter which may partly account for any loss by frost bursting the bark.

Desirable, (named in order of ripening): Richmond, Montmorency, English Morello.

Plums.

As a rule cannot be said to be much of a success. A few years ago I would have advised anyone in planting plums to plant Japans. Now I would say, "Go slow with them." I was much gratified the first few years in the remarkable growth they made, the fine healthy foliage, etc., but when they came into bearing I found they were not in it—plenty of blossom, but little fruit, and that, as a rule, of inferior quality.

They are not all to be condemned. Burbank is a good plum, so is Red June, but the last is not quite hardy here. Wickson is decidedly tender. A selection containing some of the Japans along with Glass Seedling, Lombard, and Reine Claude, would be better for those looking for quality, but those looking for fruit every year and abundance of it, will have to content themselves with the Americanas. They have some faults; the best of them are late in ripening, and occasionally they may get caught with a sharp frost in the late fall; the skin is tough and the wood is brittle, it is no unusual thing for half of the top to break off carrying the fruit with it; but their growth is vigorous, and they soon recover the damage and make very good preserves. I think we may reasonably look for an improvement in this class soon, or if someone would visit our wild plum growing along the streams in the north, sample them, and propagate from the best, we might reasonably expect an improvement in plums for the north. As a matter of fact a wild plum of a superior quality for eating out of hand would not be difficult to get, but from a commercial standpoint they would not be saleable, because, you see, they are wild plums.

Pears.

From a commercial standpoint, pears have not been a success at this station. I am not prepared to say what is hardy. The Anjou is a very fine pear, but supposed to be somewhat tender. So far, it has done as well or better than Flemish Beauty. I have several under test, mostly Russian, but not into bearing yet, with the exception of a few not worth growing. I would not care to give a list of varieties recommended or to advise planting pears extensively.

Grapes.

A few varieties can always be depended upon for pleasure if not for profit. Southern grown grapes can be had so much better and cheaper than we can grow them that there is no money in them. Still, a few vines grown near the house, produce an effect which is desirable, and it is not well just to confine our energies to the money side of the matter. I would say plant a few vines of Moore's Early, Green Mountain, Janesville, or Champion. If care is to be given, plant Delaware, but there is an occasional season when it will not ripen.

Strawberries.

These have always been a satisfactory crop at this station and bring remunerative prices. I have never yet been able to supply the local demand

for good fresh berries. I do not cover in the fall, but find the snow a sufficient protection and seldom take more than one crop off the ground. I plant in rows four feet apart by two feet in the row and find in most varieties the plants sufficiently close. A late berry is desirable here as the market is fully supplied with early fruit from the south, but our firm, fresh fruit is always in demand locally.

Among the many questions asked at this station, none are so general as: "What is the best berry to plant?" and "What can be made off an acre?" Neither of these questions do I care to answer; the first because I don't know. For a few years, Clyde was my best berry; lately it has gone back. Then Haverland took the first place, but when ripening, a few days of hot, drying wind will greatly reduce the crop. Last season, Bubach was much the best. As to how much may be made off an acre, if I were to tell, the half of those who ask the question would not believe me; besides, it largely depends on the man growing them.

Among the many varieties tried here, only a few have been unsatisfactory. Saunders and Williams have green tips. Parson's Beauty has comparatively few runners.

Splendid, Glen Mary, Tennessee, Haverland, Bubach are all good.

Currants.

If there is any one fruit we excel in, it is this. They grow to perfection almost anywhere if given shallow cultivation and plenty of manure. Among the many varieties, I can see but little difference. Some have larger individual berries, but fewer bunches. Others again lack somewhat in quality. There is no fruit which gives us less trouble to grow, and no fruit that we can so certainly depend on for a crop. They always command a ready sale locally. Either red or black bring remunerative prices and anyone who wants to grow fruit with little trouble had better confine himself to currants. Although so easily grown, it will be years yet before the local demand can be filled with choice fruit, for although early grown, they will respond readily to good care and the fruit be much larger. Take the old Red Dutch, top dress heavily in the fall with well rotted manure. Cultivate lightly in the spring and watch for results, always taking care to keep the supply of young wood up and not allowing the bark to get too thick in the center, especially the newer black varieties, such as Champion, Saunders, etc.

Recommended. For quality: Red Dutch. For profit: Champion, Saunders for black; Fay and Versaillaise for red; and White Grape.

Raspberries.

The yield of Loudons was very good. Cuthbert was a complete failure; the canes were all frozen. Marlboro gave about half a crop of large berries. Brinckle's Orange was frozen to within two feet of the ground, bore a fair crop of excellent fruit. The canes of this variety lack vigor; the fruit is superior, but too soft for shipping; only of value for home use. The Caps are little or no use here. This is not a profitable crop to grow for sale; wildberries are so plentiful, and, for preserving, people prefer them. Coming in after strawberries they fill up a blank in the season, but the demand is limited.

Gooseberries.

This crop was the largest I have ever grown here. Several newer varieties that I am particularly well pleased with have fruited for the first time. Among these I may mention Golden Prolific, the bushes of which were literally covered with large, handsome berries. Red Jacket came next in productiveness, followed up by Industry. This is the first year in which I can say that the English berries outyielded our American berries. We have never been troubled with mildew here, and this season, did not need to spray for the currant worm.

Gooseberries, after strawberries, are perhaps our best paying crop.

Recommended: Pearl, Downing, Golden Prolific, Red Jacket.

THE STRAWBERRY EXPERIMENT STATION.

By Rev. E. B. Stevenson, Guelph.

General Notes.

The season of 1907 was in some respects a remarkable one. Coming on so late, we began to feel that there was going to be a total failure. Almost everywhere it has been acknowledged that the season of 1907 taken along with the later part of the growing season of the previous year was one of the most discouraging, perhaps, that we ever experienced, not only in the strawberry domain, but in the entire fruit industry.

The season was very slow in opening. A warm week in March was followed by cold in April and May. Frost almost every night in April. May was cold, up to the 27th, snowing, sleet and rain on that day. The first part of June was cloudy and cool; east wind a good deal of the time, very discouraging to the bees, so that we began to fear that the few blossoms that were so slow in opening would not be fertilized as it was too cool and cloudy for the bees to work; but finally things came on with a rush, all varieties in a heap fruiting together. It was a somewhat unusual thing to see some of the late ones ripening with the early and medium varieties, *viz.*, Gandy and Aroma ripening with Tennessee, Prolific and other early medium kinds. The bees could not work at the time work was most needed and, as a consequence, we had a good many imperfectly fertilized berries—nubbins—but the best of the crop was as fine as I ever saw, so large and fine that it was a delight to look on the fine full boxes ready for market. I have heard some people say that it does not pay to grow these big beauties. They say you can grow a basket of small berries in matted rows for less money, and for the ordinary market. Perhaps they are right, but, if you are near or can reach a fancy market, there is not the least question about the profit of big berries. One storekeeper took all my best berries. I could not supply him with all he wanted. He said, "Why, these berries are an advertisement to my store, every box of them. I can sell these big fellows where I cannot sell the smaller ones. Some of the stores can sell the poor stuff that some growers bring in, but I do not want it. I have customers for all these big berries you can bring me." He paid me 15 cents a box by the crate. He took them all; I never had enough for him, and in case of a glut in the market these beauties will sell where the smaller ones could hardly be given away. I remember one Saturday evening I took down some

of these big ones. When I got to the dealer, another grower had just driven up with a lot of the common kind. The store-keeper did not want any of them. As I listened, I thought I would for once have to take them home, but as soon as he saw me he said, "Mr. S., I will take your berries, as I know they are all extra fine, and I can sell them all this evening." He took them, and gave me 15 cents a box, when he did not want the common kind at all. Of course these *big ones* mean more work in the field in the cultivation, etc. You cannot grow these bouncers without work, a good deal of finger work and backache. Another thing, you must be careful in the picking of them after you have grown them. I have found that some pickers spoil a good job in the picking. They take hold of the berry and pull at it till it comes off the stem. Nine times out of ten the berry is bruised and mashed somewhat and you can never afterward get it to make a fine appearance; or they will hold two or three berries in the hand and try to pull others, thus mashing all of them, or the berry comes off the hull and never will look well. I instruct my pickers to let the berry alone; to take hold of the stem of the berry, and then if the berry is ripe to pick off the stem with the thumb and first finger nails, leaving enough of the stem to handle the berry by, without touching it. There are pickers who will go this far all right, and then throw the berry some distance into the box. I will not have any of that after a fair trial. I have no use for such pickers. I want my berries handled with the greatest care. The glory of picking and handling these fine berries compensates for the finger and backache required in keeping the plants clean.

I have not yet succeeded in growing your ounce berries, or 12 berries to a box.

My Method of Cultivation. The ground taken has been for two or three years given up to roots to avoid the white grubs which are found in quantity often in sod or newly broken or grass land. I manure freely, with as well rotted stable manure as I can get, plowed and well worked with harrow. The rows are 3½ to 4 feet apart and plants 2 feet apart in row. Cut off all blossoms and cultivate once a week to keep clear of all weeds. If you have some well rotted manure to work in as you cultivate, it is a good thing and will repay in the fall, after growth has stopped and the ground is frozen, to give the plot a mulch of pea-straw. This mulch I have found to be the best, does not lie so flat as wheat or oat straw, it holds the snow better than either of the other kinds. In spring this mulch is raked into the paths where it helps to hold the moisture in the ground and keeps the berries clean.

Fall Bearing Varieties.

For some time there has been a good deal said about certain varieties that were claimed to bear a good crop in the fall season, and it was said they were as good as the spring varieties and were more profitable. The most lauded of these fall bearers, perhaps, is one called Pan American, a sport of the Bismark. Three years ago I sent for plants of the Pan American. I have been growing it since, and as the result of my experience, I would not advise anyone going into the growing of the so-called fall bearing strawberries for profit. On this subject I would say that I have found than any of the old varieties will bear berries in the fall under certain conditions, and the conditions, some of them at least, are: If the spring is cold, wet and long, followed by a season of drought, then in the latter part of August or early September if you have a good deal of rain, you can look out for fall straw-

berries. We had berries all through July, while usually the season ends with June. You may pinch off the blossoms and later on in late September or early October you will have a few berries of any kind so treated. But what kind are they? Just like any berry or fruit out of its season. They do not taste like, nor have they the aroma or flavor of, the spring grown strawberry. Sometimes they are of fair size, but they are sour or insipid, and you do not want to eat more than one, at most two of them. I would like to ask how much money a man would make in cutting off all spring set blossoms and waiting for fall berries. I would say none at all, for by the time he would get through taking off all the bloom, he would find another crop. There are sorts that will send up a third or even fourth fruit bud after the first have been cut off. I noticed this the past summer in the 3 W's. In spring set plants they kept blooming and ripening some fine berries all through the summer, but the berries were inferior in quality to the spring ones. From my experience, I would say that the fall growing of strawberries for profit is a failure and a fraud, and would not recommend anyone to try it.

The season of 1907 was between two and three weeks late. It was almost July before any quantity was ripe. We picked until the 25th of July, a few scattered ones after that time. The last picking of Yant, Hummer, Hundred Dollar, Arnout, Woolverton, Joe, Minuteman, Wonder, Cardinal, New York, Three W's, Glen Mary, Brandywine, Aroma, was on the 15th of July and sold for 15c per box.

Among the newer kinds that were very promising I may mention the following: The Hummer, Hundred Dollar, Arnouts, Beidler, Jacoma, Abundance, King Edward, Virginia, Oak's Early, McNeil, Chesapeake, Stevens Late Champion, and Ekey.

Among the older kinds, the best were: President, Joe, Three W's, Minuteman, Pocomoke, Kitty Rice, Bismarck, Uncle Sam, Wonder, Howard's No. 3, Auto, Early Hathaway, Ernie, Ben Davis, Commonwealth Mead, Cardinal (must be well fertilized), Heflin's Early, Early Beauty. The old standards made good their place as worthy of a first place, they are: Sample, Haverland, Splendid, Glen Mary, Parson's Beauty, Ruby Tennessee Prolific, Williams, Brandywine, Warfield, Latest, Senator Dunlap, Bubach, Beder Wood, Margaret, Marshall, Ridgeway, Success, Van Deman, Wm. Belt, Woolverton, etc.

List of Varieties in Alphabetical Order.

Arnout (Perfect): Sent out by J. L. Arnout of the Keystone State in 1906. Plant healthy, strong grower, good runner and productive. Berry large, conical, bright, scarlet, yellow seeds; flesh white and pink, medium in firmness, medium to late season. A good one, worth a trial.

Abundance (Perfect): Sent me by S. Woodruff & Sons, of New York. Plant strong, healthy grower and a good plant maker, quite productive. Berry bright scarlet with yellow seeds, conical, of medium firmness, good quality, medium to late. Worth a trial.

Advance (Perfect). Introduced by A. B. Printz of Ind., 1903. Plant good grower, light yellowish green foliage. Did not do very well. Will give it further trial.

Abingdon (Perfect): From L. Blanchard of Mass. Plant strong grower, healthy and large. Not so productive as last year. Berry large, roundly conical, crimson and red seeds, medium in firmness, good quality. Late; some of first berries irregular.

Almo (Imperfect): Chance seedling by J. Bauer of Ark. Plant strong and healthy. Berry medium to large, dark red. Plant productive.

Auto (Perfect): Came from Maryland. Plant is healthy and strong grower. Productive. Berry is very large, dark scarlet in color with yellow seeds, round in shape, flesh red; medium firm; fine flavor. A good one.

Armstrong (Perfect): Indentical with New York, Corsican, Maximus, and Uncle Jim. The plant is healthy, large and strong, medium in productiveness. The berry is large to very large and fair flavor. A good one for amateurs to plant.

August Luther (Perfect): Plant small but healthy. Fair runner, medium productive. Does well in some places. Early. Medium in size.

Annie Hubach (Perfect): Sent me by the originators, H. & H. of Ark. The plant is a good grower, healthy, light green color, productive. The berry is medium to large, bright scarlet with yellow seeds. Hollow, flesh pink, medium quality, and medium in season.

Alice Hathaway (Perfect): Sent me by the originators H. & H. of Ark. The plant is healthy. Makes plants freely and productive. The berry is medium to small in size but good quality.

Aroma (Perfect): An old standard—one of the late sorts. The plant is dark in foliage, healthy: The berry is large, roundish, same season as the Gandy. Widely grown, as best late.

Beaver (Perfect): Sent out by M. Crawford of Ohio. The plant is small and lies close to the ground, a fair grower. After a fair trial, I have decided to drop this. It is too small and not productive.

Buster (Imperfect): Sent me by the originator, C. C. Stone of Ill. The plant is strong and healthy, a good grower. Large and dark green foliage. No rust. The berry is large, pinkish in color medium in firmness, productive, fair in quality, season late. Will do for nearby market.

Beidler (Imperfect): Plant strong grower and healthy; vigorous and productive. Berry is large with a neck, bright scarlet with yellow seeds, solid, flesh red and firm, good quality. A good one.

Beavers (Perfect): Not the Beaver. Sent me by M. Crawford of Ohio. Plant a good grower. Did not do well with me. Will give a further trial.

Ben Davis (Perfect): Plant is a good grower, healthy and productive. Berry large, roundly conical, scarlet, flesh firm, solid. A good quality and flavor.

Baston Prize (Imperfect): Plant a good grower, healthy and productive. Berry is large and conical, pale scarlet pink. Berry too soft. Not desirable; will drop it.

Beder Wood (Perfect): One of the best early kinds. Well known.

Bubach (Imperfect): An old standard which still maintains its place

Bismarck .(Perfect): So well known it needs no description. It did well the past year with me.

Brandywine (Perfect): One of the best late varieties. Well known. Needs no further description. Did well this season with us.

Chesapeake (Perfect): Originated 1903 on Chesapeake Bay by J. W. Parks of Wicomico Co., Md., and introduced by W. F. Allen in 1906. The plant is very large, with thick leathery leaves. Healthy, fair runner, medium productive. The berry is large, round with a nose. Bright, glossy, scarlet, resembles Bismark. Yellow seeds, solid. Flesh white and pink, firm. Worth a trial.

Commander (Perfect): Plant is large, healthy and strong. Had a few very large berries, but not enough. Will give further trial.

COMMONWEALTH (Perfect): Sent me from Massachusetts originated by W. H. Munroe. Plant is healthy, good grower and quite productive. Berry is large, conical, very firm, sweet and good quality. A good late. Will prove, I am sure, a good shipper. One of the latest, and so has a short season. Well worth a trial by all growers for far market.

CARDINAL (Imperfect): Sent me by originator, Mr. Streator of Ohio. The plant is healthy, strong, a good grower, but unless well fertilized, not productive enough. The berry is large, very firm, good flavor. Did not do as well this year as last, I think owing to the lack of sufficient pollen to fertilize the blossoms.

CLYDE (Perfect): One of the best known and widest grown. Very productive. The plant is failing in vigor, does not produce enough foliage. The berry is very large, light scarlet and good quality.

CATHARINE (Imperfect): Originated by J. F. Cannon. The plant is large, healthy, with thick broad foliage, quite productive, a good runner. Berry is large, roundish, conical, red to centre. Colors well all over. Medium in firmness. Good for near market. Did well.

CLIMAX (Perfect): Seedling of Bubach by Mr. Graham of Maryland Plant is healthy and productive. Berry large, scarlet and quite early.

CORSICAN (Perfect): Same as Armstrong.

CHALLENGE (Perfect): I have given this variety a good trial and have decided to let it go. It is not to be relied upon and so not profitable.

DUNCAN (Perfect): Sent me by M. Crawford. After two years' trial this variety has proved of no worth at all. Wonder why such worthless things are sent out.

E. H. EKEY (Perfect): A new one. Sent me by M. Crawford of Ohio. Plant a strong grower, productive. Berry is large, bright, glossy red with red seeds, solid and firm. Good quality but of short season. Two or three good pickings and it is over. Worth a trial for market.

EARLY HATHAWAY (Perfect): Sent me by the originator, Hathaway, of Ark. Plant a good grower, healthy. Runs freely. Plant somewhat tender, berry roundly conical, red all through the berry, fair quality medium to large, scarlet color, a good early.

EARLY MARKET (Perfect): Plant healthy. A good runner. Fairly productive berry scarlet, medium size, roundish in shape.

EARLY BEAUTY (Perfect): This one did well. Plant found in a field of crescent in Iowa. Introduced by M. Crawford who sent me plants of it two years ago. Plant is healthy, good plant maker, quite productive, berry roundish red, flesh red and but fair quality. Worth a trial.

ERNIE (Perfect): Plant is a good, strong grower, healthy, quite productive. Can only say it did well again, as last year; berry ripens early. Red color with yellow seeds, large size, round, a good medium early.

ELMA (Imperfect): Sent me by the originator, J. H. Black of N.J. Elma is a seedling of a cross of Nettie and Roblin, fertilized by Joe. The plant is healthy, strong grower and fairly productive. Berry is large, round in shape, a bright red color, flesh pink, medium in firmness. It is one of the latest. Worth a trial.

EMPEROR AND EMPRESS (Perfect): Originated by the late J. Little, Ontario. They resemble each other very much. Plant strong and healthy. Berry is large and fine quality. Look like the old Jessie very much.

FOUNTAIN (Perfect): Plant one of the most vigorous growers. Healthy and productive. The berry is a good size, conical, quite firm, a good dark scarlet color with yellow seeds, good flavor, a good shipper. Worth a trial by all growers.

Fairfield (Perfect): Plant healthy, good runner, fairly productive. The berry is large, red color, firm and good quality. It is early.

Florella (Perfect): This is a seedling of Bubach by Dr. Brown. The plant is healthy, a good grower, productive. Berry is large irregular, a good early. Did well the past season.

Great Ruby (Imperfect): Sent me by P. Henderson of New York. Plant a good strong grower, fine runner, healthy. The berry is dark crimson with yellow seeds; flesh red, firm, of good quality, medium in productiveness.

Gen. De Wet (Imperfect): This is a seedling of Bubach and Parker Earle, sent me by J. Kewitt of N. J. The plant is a large, strong grower, healthy, only medium in productiveness. The berry is quite large and fine looking. Medium firm and good color.

Glen Mary (Perfect): Plant is a strong grower, large, dark green foliage, widely grown. Berry large, irregular, dark red. Has done well wherever grown. A good market variety,—late.

Gandy (Perfect): A standard late. Well known. Did well.

Granville (Perfect): Supposed to be a seedling of Miner's prolific. The plant is large and healthy, a good grower. The berry is large, oblong, bright, shiny, red color. Flesh firm, white inside, fine flavor; medium to late, only medium in productiveness.

Greenville (Imperfect): Resembles the Bubach very much, though berry is not as large. Plant is a dark green, healthy, a good grower and quite productive, berry large, good bright red, medium in firmness. A good one for near market.

Hummer (Perfect): Sent me by W. F. Allen of Md., 1906. Well named. The plant is strong, healthy and good grower. Productive. The berry is large, bright scarlet, flesh, pink. Yellow seeds. Of good quality, firm, a good one. Worth a trial by all growers.

Hundred Dollar (Perfect): Sent me by W. Hathaway of Ohio. The plant is healthy, large, strong and vigorous grower. Quite productive. The berry is one of the largest, scarlet with red seeds. Roundly conical, flesh white and pink, mild good flavor, resembles Woolverton. A good one, worth trying.

Homeland (Imperfect): One of the standards. One of the most productive. It has been for a great many years at the front. It did well the past season. It has been widely grown; still the favorite with many. Its imperfect blossom is somewhat against it.

Heflin's Early (Imperfect): A good early sort. Plant is healthy, good grower. The berry is good size, good quality and firm; worth trying for market.

Howard's No. 3 (Perfect): Sent me by the originator, A. B. Howard, of Massachusetts. It is a seedling of Clyde. The plant is a rampant grower, healthy and very productive. The foliage is light like the Clyde. Berry is medium to large, firm, conical, bright scarlet, with yellow seeds of good quality. A good market kind, and when introduced will be worth trying by market growers.

Howard's No. 7 (Imperfect): Sent me by originator, Mr. Howard, of Massachusetts. This is a seedling of Haverland, crossed with Marshall. The plant is healthy, good grower, productive. The berry is conical in shape, good flavor and I think will prove valuable.

Howard's No. 103 (Imperfect): Sent me by the originator, Mr. Howard, of Massachusetts. This from a seedling of a seedling of a Crescent and Clyde cross. The plant is healthy, a good grower and quite productive. The berry is large, roundly conical, dark red and firm, seeds somewhat

imbedded and early. I believe when introduced will prove a good market variety.

Howard (Perfect): Sent me by originator, J. H. Black, of New Jersey. Grown from seed of Burton's Eclipse, fertilized with Gandy. The plant is large, strong, healthy, of very dark green foliage. Berry is a good size, dark red, quite firm. Season late.

Howard's No. 2 (Imperfect): Sent me by son of originator, the late G. W. Howard, of Michigan. The plant is small but a good runner, has some rust on it, but quite productive. The berry is a fair size, roundish, solid, pink flesh, good quality, medium in firmness. Did well with me this year.

Howard's No. 96 (Perfect): Originated by same grower as the last variety described,—the late G. W. Howard of Michigan. The plant is quite healthy, makes plants freely and quite productive. The berry is medium to large, dark scarlet in color, roundish. Flesh red all through. Solid, firm and fine quality.

Ham (Perfect): Sent me by the originator, J. H. Black of New Jersey. This is a seedling of Mary and Parker Earle. Plant resembles Mary; is a good grower, strong and healthy, very dark green foliage; medium in productiveness, berry is large, dark red, flesh dark red; good flavor. Berry smooth and firm.

Irene (Imperfect): Sent me by the originator, Mr. Riehl. The plant is a good runner and plant maker, dark green foliage, plant not large. The berry is medium to large, conical, bright scarlet with yellow seeds. Berry has a cavity in centre. Of medium firmness and fair quality.

Ideal (Perfect): A seedling of Bubach and Hoffman by J. W. Kerr, of Maryland, in 1894, sent me by originator. The plant is healthy a good grower and fairly productive. This is its only weak point: the berry firm, of true conical shape. Bright scarlet color with yellow seeds, a beautiful looking berry; fair quality. The berries all look as if turned in a lathe, so regular are they.

Jacoma (Perfect): Sent me from Virginia. The plant is a good strong growing kind, runs freely and productive. The berry is large, glossy red, medium firmness, good quality. Will give further trial.

Joe (Perfect): A seedling sent out by J. H. Black of New Jersey. Mr. Black sent me plants some years ago, and it has always done well with me. The plant is healthy, a good grower and quite productive. The berry is a large bright scarlet, obtuse conical, quite uniform in size and shape; the quality is of the best. Season medium to late. Well worth trying.

Johnston's Early (Perfect): This variety never has done much with me. Only medium early. Sour and not productive enough. Is said to do well in some places and soils.

Jaggets (Perfect): I have given this a good trial. It has never done well with me and I do not hear of its doing well anywhere else, so will drop it.

King Edward (Perfect): Sent me by the originator, D. J. Miller, of Ohio, in the fall of 1906, so what I have to say will be from trial of fall set plants. The plant is very large, strong and healthy. Roots easily and makes runners freely. I should say, quite productive. The berry is large, roundish, solid, bright scarlet and red seeds. Flesh is white and best quality. It is very promising. I informed Mr. Miller that the name of our king was "Edward," and congratulated him in naming such a fine variety after our King Edward. He replied "I was not aware of that until I got your letter." Last spring I heard of another berry that had been called

"King Edward." It was sent me by a Mr. Crysler, of Galt, so now we have a "United States King Edward" and a "Canadian King Edward"—good long names. Neither of those originators seemed willing to change the name they had given to their offspring. Will have more to say about them after next year's fruiting.

Kitty Rice (Imperfect): This is a good one. Comes from Ohio. The plant is healthy, a good grower, makes plants freely, quite productive. The berry is large and fine, roundish, bright, glossy red, fair quality and firm. Makes a good show in the crate A good one; worth trying.

Latest (Imperfect): Sent me by the originator, S. H. Warren of Massachusetts. The plant is healthy, strong grower. Does not make many plants but starts out quite productive. The berry is large, conical, crimson; flesh, red. Firm and good quality; one of the latest. Perhaps the most promising late variety. The berry is not perhaps as large as Nettie, but finer looking.

Louis Hubach (Imperfect): Sent me by originator, Mr. Hubach, of Arkansas. Seedling of Warfield and Lady Thompson. The plant is healthy good grower and productive. The berry is bright, dark scarlet with yellow seeds, conical in shape. Flesh red all through and solid. Medium in firmness. Of fair quality.

Lyon (Imperfect): Plant healthy and a good grower. Productive. The berry is dark glossy red, long pointed, with red seeds. Flesh red, fair size. Like the old Longfield of Dr. Stayman's days. Medium to late. Quality is good, and fine flavor.

Lester Lovett (Perfect): Very much like Gandy, both in plant and fruit and season.

Mark Hanna (Imperfect): A strong grower, healthy and fairly productive. The berry is quite large, of dark red color. Somewhat tough but of good color and fair quality. Would do for near market.

Mrs. Mark Hanna (Perfect): Plant is strong grower, healthy, but has some rust. Produced some of the finest berries of good color but not very prolific.

Mrs. Miller (Imperfect): The plant is large and healthy. Not very productive. The berry is large, bright red; flesh, red. Oblong. Somewhat flattened and good quality. Season medium to late. Many better kinds.

Mellie Hubach (Imperfect): Sent me by the originators, Hathaway & Hubach, of Arkansas. The plant is healthy and a good grower and very productive. The berry is bright scarlet with yellow seeds, conical in shape, blunt at end, with a slight neck; flesh, pink and white at centre. Good flavor. Somewhat acid. Will prove a good market berry. Worth a trial.

Mead (Perfect): Originated by H. O. Mead, Ex-President of Massachusetts Fruit Growers' Association, and sent me two years ago. It has proved a good one. The plant is strong and healthy. No sign of rust, a good runner. The foliage is dark green and quite productive. The berry is large, fine looking, roundish, coloring all over at same time, firm and good quality. Will take a front place.

Mrs. Fisher (Imperfect): Sent me by the originator, J. H. Black. It is a seedling of Bubach and Sharpless. The plant is healthy, strong grower and productive. The berry is large to very large, a bright scarlet color, medium firm, good quality, late, valuable for near market.

Morning Star (Perfect): Did not prove very valuable after a fair trial. Will drop it.

May King (Perfect): Plant healthy. Good runner; quite productive; berry bright scarlet, but appears quite soft. Will give further trial.

Minute-Man (Imperfect): This has proved one of the best with me. It was sent me by M. Crawford two or three years ago. It is one of the most promising. The plant is a strong grower; resembles Senator Dunlop, but is stronger and free from rust, and quite productive. Every berry is as smooth as a ball, is large, crimson with yellow seeds; flesh, reddish pink all through, medium firm and good quality. Well worth trying.

Margaret (Perfect): A kind to grow for fancy market. Will take a lot of petting, and when it gets it, will produce some of the finest berries. The plant is healthy. Makes enough plants for fruiting row.

Marie (Imperfect): A good market berry. A seedling of Crescent. Plant is a good, strong grower, healthy and productive. Berry is large, roundish, somewhat irregular, quite acid but spicy. Medium firm.

New York (Perfect): Resembles Corsican Armstrong very much. See "Armstrong."

No. 99 (Perfect): Sent me by M. Crawford. Did not do very well with me. Will give further trial.

North Shore (Perfect): Has not proved very valuable. I have fruited it two years. Will let it go.

New Home (Perfect): Sent me by introducer, W. F. Allen. Resembles Gandy. No better than Gandy.

Netie (Imperfect): Sent me by the originator, Mr. Black of New Jersey. Plant is strong grower; makes plants freely and quite productive. Berry is very large and irregular. It is one of the latest, if not the very latest. It has done well with me. Not very firm.

Nehrings' Gem (Imperfect): Sent me by M. Crawford of Ohio. The plant is a strong healthy grower, light colored foliage. Medium in productiveness. Berry is good size, good color, promising. Will give further trial.

Nimrod (Perfect): Originated by J. F. Beaver of Ohio, and sent me two years ago. The plant is small and lies close to the ground; healthy and only fairly productive. The berry resembles the old Jersey Queen. Very good quality. Might please the amateur grower.

Oak's Early (Perfect): Sent me by the introducer from Maryland. The plant is a good grower, healthy, small, of dark foliage and very productive. Berry is medium to large, dark red with red seeds; flesh red. Medium firm, good flavor; early to mid-season. Worth a trial. This variety was found by Wm. Tull, by the side of an oak stump, in 1902, hence the name.

Oom Paul (Perfect): Sent me by the introducer and originator, Mr. Kewitt of New Jersey. The plant is large and healthy, making plants freely. Medium in productiveness. Berry is large and somewhat irregular; dark red in color. Not very desirable; only did fairly well.

Olive's Pride (Perfect): Sent to me by originator, J. W. Hall of Maryland. The plant is a good strong grower, healthy and quite productive. The berry resembles the Crescent, from which it is descended. Did well the past year.

Parson's Beauty (Perfect): Originated in Maryland in 1895. Plant is a strong, healthy grower. Of dark green foliage. Makes plants freely. It is quite productive. The berry is like the old Wilson, a dark, rich scarlet. Ripens all over, with yellow seeds. It is firm and good quality; pleasant taste. One of the best for market growers.

President (Imperfect): Sent me by the originator, Mr. Hunt. It is a seeding of a pistillate seeding, fertilized with McOlivier. The plant is large, a good grower, rusts some; fairly productive. The berry is quite large and fine looking, medium in firmness, brings a good price in fancy market. It did well the past year.

Pan-American (Perfect): A sport of Bismark. Claimed to be a fall bearer. After three years' trial it has not shown itself of much value. It does sometimes have a few berries in October. I would only grow it as a curiosity. No value for market.

President Roosevelt (Imperfect): Too much lost. Not desirable. Will drop it.

Peerless (Perfect): Sent me by the originators, H. & H. of Arkansas. Plant is large and strong. A good grower, late bloomer, shy bearer. Not desirable. Will drop it. This has proved a great disappointment here.

Perfection (Perfect): The plant is a good strong grower, healthy and productive, berry medium in size, dark scarlet, conical, firm and good quality. Did fairly well.

Prof. Fisher (Perfect): A seedling of Bubach and Sharpless. Sent me by the originator, Mr. Black of New Jersey. The plant is large and healthy, strong grower, and medium in productiveness. Resembles Mrs. Fisher a good deal.

Ridgeway (Perfect): Plant does not make many runners, but is healthy. Stools out. Medium productiveness. The berry is large, roundish, of a dark bright red with golden seeds. Firm and of good quality. Medium to late. Worth a trial. A good one.

Ryckman (Perfect): The plant is large, good grower and healthy. Only medium in productiveness. The berry is large with a neck roundly conical. Very good quality. Might be grown for a fancy market.

Ruby (Perfect): Plant good grower, making plants freely. Dark foliage and productive. The berry is large, conical like the old Wilson. The quality is good, has done well, is a good one and worth a trial.

Sample (Imperfect): This is one of the best market kinds. I hear good accounts of it from all over. Wherever grown, plant a vigorous, healthy grower and productive, and has always done well with me.

Splendid (Perfect): Here is another of the best market varieties. The plant is vigorous, healthy and very productive. The berry is round, bright, scarlet, large and firm. All should grow it.

Success (Perfect): Plant a good grower, making sufficient plants for a good fruiting row. Productive. The berry is medium to large, roundish, conical, firm. Dark scarlet in color, good flavor. Did well the past season. Early.

Senator Dunlop (Perfect): This is another of the good ones. One of the best market kinds. Plant a good, vigorous grower and quite productive. Berry is conical, dark scarlet, firm, medium early to late. All should grow this variety.

Sutherland (Imperfect): Good grower, healthy, berry softish. Did fairly well.

Superior (Perfect): Plant good runner. Quite productive.

Stevens' Late Champion (Perfect): Plant is a strong, healthy grower, productive. Berry is large, scarlet with yellow seeds, roundish, resembles Glen Mary. Firm, fair quality, late. Worth a trial.

Tennessee Prolific (Perfect): One of the old standards. Has always done well with me. Good market berry. Well known.

Three W's (Perfect): Sent me by the originator. I have fruited it twice and it has given me a larger crop each time. The plant is a good

grower, strong, healthy and very productive. The berry is large, conical, blunt at end, a bright scarlet color with yellow seeds, good flavor, firm, flesh, pink to white. A good one and worth a trial by all growers. Medium to late season.

Texas (Perfect): Plant is large, healthy grower, medium in productiveness. Berry is large for an early berry, firm good quality.

Thompson's No. 3 (Imperfect): Sent me by originator, Mr. Thompson of Virginia. Plant a good healthy grower. Did only fairly well. Will give another trial.

Uncle Jim (Perfect): Like New York and Armstrong, a good fancy berry.

Uncle Sam (Imperfect): The plant is a strong healthy grower and productive. The berry is very large, one of the largest, roundish, bright scarlet with red seeds. Fair quality. Medium in firmness. Worth trying. Mid-season to late.

Uncle Joe (Perfect): Sent me by Vick & Sons of New York. It bore a few large berries. Will give a further trial.

Virginia (Imperfect): Sent me by the introducer, Mr. Allen of Maryland. Originated by Thos. J. Custis of Accomack Co., Virginia. A cross of Hoffman and Sharpless in 1905. A good grower. Makes plants freely. Dark foliage, productive, berry blunt at end, medium to large, dark red with red seeds. Has a cavity. Flesh red, mild, firm. Fair quality. Mid-season.

Van Deman (Perfect): Gave us some of the first ripe berries. Has a long season. Does not do well in some places. Has always done well with me. It is firm, one of the handsomest of berries. It was first sent me by the originator, J. C. Bauer, of Arkansas, twelve years ago.

Victor (Perfect): Sent me by M. Crawford. Plant strong. Healthy grower. Productive. Dark green foliage. The berry is large, dark crimson, with yellow seeds, firm and good quality. Did well this season. D. J. Miller of Ohio is the originator of the Victor.

Wonder (Perfect): Known as Sampsell's Wonder. This plant is healthy, a strong grower and productive. Berry is large to very large, dark bright red of good quality, medium of late season. a good one; worth a trial.

Wilson (Perfect): The old Wilson's Albany was a failure this year. I grow it for the purpose of comparison.

Wild Wonder (Perfect): Will drop this variety. After two years' trial it has proved to be of no value to me.

Wm. Belt (Perfect): One of the old standards. Did well again this year. It is injured sometimes by the rust. The first berry is irregular generally. The berry is conical, bright, firm and good quality.

Williams (Perfect): Widely grown for shipping. It can be picked before it is ripe as it colors before it is ripe. Only medium quality. The plant is weakening. Sometimes it rusts badly.

Warfield (Imperfect): One of the most productive in a favorable season. Rampant plant maker. Berry dark crimson. Conical, but the plant is very sensitive to any weather. Wants lots of water to do its best.

Woolverton (Perfect): Originated by the late J. Little of Granton and named after L. Woolverton, the Secretary of Experimental Stations. Did well. One of the largest and finest of berries. Plant is strong and healthy grower and a good pollenizer.

Yant (Perfect): Plant strong and healthy, light foliage. Productive. Berry is large, regular, with a neck. Mid-season. Did well the past season.

New Varieties for Trial.

Last spring I received several new varieties from originators and introducers of new varieties. I have them planted in a trial plot for next year's fruiting. Most of them have made a good showing so far. I have not noticed any rust or disease on any of them. They are as follows:—Arizona, Brilliant, Bradley, Blaine, Bower, Crozier, Chipman, Colossus, Diamond, Dixie Belle, Dighton Rock, Evening Star, Golden Gate, Gill, Good Luck, Goldsborough, Great Scott, Goo Rollins, Gen. Joe Wheeler, Howard's No. 1, Irena, King Edward, McNiel, Mill's Seedling, Miss Boston, Oswego, Pride of Michigan, Red Bird, Saratoga, Young's Early Sunrise, World's Wonder, St. Louis.

List for Growers and Season of Fruiting.

Extra Early and Early: Van Deman, Michel, Success, Oak's Early, Heflin's Early, Early Hathaway, Howard's No. 103 and Howard's No. 3, Excelsior, Beder Wood, Texas, Staples.

Early Mid-Season: Splendid, Tennessee, Prolific, Ekey, Warfield Bismark, Senator Dunlop, Parson's Beauty, Reynolds, Homeland, Bubach, Sutherland, Marshall.

Mid-Season: Three W's, Hundred Dollar, Hummer, Glen Mary, Beidler, Jacoma, Mead, Minuteman, Brandywine, Woolverton, President, Kitty Rice, Sample, Uncle Sam, Wonder, Lyon, Marie, Saunders, Williams, Arnout, Virginia, King Edward, Wm. Belt, Greenville.

Late to Extra Late: Aroma, Joe, Gandy, Abingdon, Chesapeake, Steven's Late, Champion, Latest, Howard's 96, Elma, Nettie, Cardinal, Commonwealth.

ESSEX VEGETABLE EXPERIMENT STATION.

By E. E. Adams, Leamington.

Forcing Vegetables.

The conditions for forcing vegetables this year were very unfavorable. No particular success was attained on tomatoes, but cabbage turned out some better, owing to its different nature. Tomatoes require warmth, while cabbage will grow under cool conditions. Tomatoes were planted about May 20th, and were frozen, but the balance of the planting was made, commencing about the 24th and ending about the 28th for early crop. Not much growth was made during June, even with applications of nitrate of soda, but about July 10th they made a good start, and about the last of the month regular shipments began, being about three weeks later than usual. Our cabbage ground was well fitted up for a crop, being fertilized with sheep manure (pulverized) 1,500 pounds, sulphate of potash, 200 pounds, and Peruvian Guano 1,000 pounds per acre, upon soil with a fair crop of rye ploughed in, and 300 pounds of nitrate of soda scattered around the plants and in the rows during growth. This was planted May 1st, and grew very well, with shipments starting June 15th and ending about July 10th. The varieties, Early Jersey Wakefield, Johnson's Early, Glory of Enkhousen, Express, and Maule's First Early, being tested under the same treatment to see if the claims

as made by seedsmen were correct. I find the Wakefield the most profitable, the earliest and most productive, but the Glory of Enkhousen is a good cabbage, having a good hard head of good size and quality; but, for commercial purposes, where earliness and productiveness are large considerations, the Wakefield appears as yet to be the best for this purpose, and the quality is first class, especially where plenty of nitrate of soda is used. The soda appears to give cabbage a character and sweetness that common barnyard manure does not.

Musk melons and cantaloupes were a fair crop, not much later than usual. These generally come into the market about August 12th to 15th, while this year they appeared about the same time from plants started under glass. These plants started under glass, were fertilized with nitrate of soda about half an ounce to the hill; sulphate of potash, one ounce; Peruvian Guano two; all mixed and hoed in, on land where rye had been turned in and planted about June 15th. They started off, and made a very good growth, but not nearly as much as in former years, and set a very good quality of fruit, which made a fast growth in July, and owing to very warm, dry weather in August, ripened up the crop very quickly. There was considerable blight, and while on some varieties it was very bad, others did not show its effect nearly as much.

Spraying was carried on to some extent; the Long Island Beauty and Hackensack did not respond to its use as did the Rocky Ford, Gold Coin, Ideal, Burrell's Gem, Model, Grand Rapids and Unsworth's Perfect. This may show that the Hackensack and Beauty are more tender and that the spraying is not as effective on them. The spray was applied twice only durthe season, once immediately after planting, with Bordeaux and Paris green added to clear them of striped beetle, and again in about four weeks with ammoniacal copper solution, this being used so that the fruit would not be discolored as it would be with Bordeaux applied after fruit has attained considerable size. The seed planted in the field in the usual way gave a very light crop. Owing to the cold weather early in the summer, they were very late in starting, and were small plants when blight struck them, and consequently being tender they melted down as though burnt with fire. This blight appears to be very hard to control, yet some growers think it fairly easy, while in the large melon growing sections of the United States it is considered almost impossible to handle it. This work will have to be handled next season more thoroughly in order to see just what can be done to prevent the destruction of the vines, and bring the crop to maturity with full flavor and quality.

Tomatoes.

The past season has not been a very favorable one for growing some kinds of vegetables. Tomatoes have not had enough warm weather to bring them to their usual perfection. The later varities especially have proven very unprofitable, many growers having lost money on the crop, largely from rot during the month of August. The crop of early varieties was fair only, being considerably later than usual. Usually shipping starts here early in July, but owing to the very cold months of May and June, the plants made very little growth, in fact a large number of plants were killed by frost on May 20th, which caused a diminished crop. The late varieties under test this season were Stone, Plentiful, Magnificent, Beefsteak, and success. I find the stone of the best quality, not only for home use, but it is also considered by canners to be about the best that is grown for their

purpose. The only objection to it on sandy soil is the light crop that it gives. The color is bright red, smooth, solid flesh and large size, and very fine quality. The *Plentiful* has done better with us than some other of the Pink or purple varieties. It is one of the finest tomatoes that I have ever grown. Flesh dark red, solid, smooth, and of good size, two rows filling an 11 quart basket placed on side. This tomato will produce more to the acre than any other that I have grown here. *Magnificent* is a good hard tomato, bright red and smooth, not a good cropper this season, but may prove better next year. Success is a bright red, smooth medium size tomato and not a good cropper here. The *Beefsteak* is also smooth, red, and only a fair cropper. For late crop I would recommend the Plentiful for sandy soil, and the Stone for heavier soil. A large number of early and so-called early varieties were tested this season, the following being the varieties:—Dominion Day, Maule's First of All, Steele's First of All, Rennie's First of All, Imperial Freedom, Swedesboro', Earlibell, Early Jewel, Livingston's Beauty, Magnus, June Pink, Alpha Pink, Early Michigan, Fordhook First, Dwarf Champion, Quarter Century, Globe, Moore's King of the Earlies, Hummer, Atlantic Prize, Earliana, Burpee's Sunnybrook strain of Earliana, Burrell's Earliana, and Johnsons's No. 10 strain Earliana. Among these there are some that cannot be called early, but should be called second early. The Early Jewel, Beauty, Michigan, Hummer, and June Pink being in that class. The Jewel will rot some seasons under certain conditions. This year they rotted badly. The plants were about six inches in length when set out about June 1st, while plants that were in bloom and 12 to 14 inches long heavy and stocky had no rot and were set out about May 24th. Usually any of the above varieties will give a fair to good crop of good fruit. The other Early varieties mentioned are all fairly good on our sandy soil, but the Atlantic Prize on certain soils along Lake Erie appears to be about the best cropper, although taken a mile back from the lake, it is not nearly as good and cannot be as profitable as Earliana. Certain elements in the soil at the Lake appear to be favorable for its development; while the soil along the Talbot Road appears to be better suited to the Earliana. This latter is the best and most profitable one we grow, from the fact that it is early, quite smooth, and ripens well to the stem. It is a very good cropper on soil well prepared with stable manure, well rotted and put on in the previous fall and ploughed under early in spring, and fertilized with potash, phosphoric acid, and nitrate of soda, 200, 40 and 100 pounds respectively. The soda should be applied around the plants a few days after planting, and worked into the soil at once. The Earliana does not do as well as regards ripening when grown on heavier soil, but produces a heavier crop than on sand but later and consequently, from a commercial view, it will not prove valuable. I would recommend the following as the best general list of varieties for sandy soil: Earliana, Atlantic Prize, First of All, Fordhook First, Beauty and Dominion Day; while June Pink, Alpha Pink, Champion, Quarter Century, Magnus, Michigan, and Hummer will prove better for a heavier soil and produce nice, smooth fruit. The Ruby, Swedesboro, Earlibell, King of the Earlies, are all quite rough, and do not prove as valuable for shipping or for home use as most of the others mentioned.

Varieties of Tomatoes.

Earliana: The earliest smooth bright red tomato of good size. Plant is compact in growth, fruit quite uniform in size, flesh quite solid, averaging from 2½ to 4 inches in diameter on sandy soil and much larger on heavy soil.

ATLANTIC PRIZE: As grown on sandy soil at Leamington, it is smooth, firm, a heavy bearer and one of the most profitable to grow for early market. Seed selection has made a wonderful change in this tomato, being now here as smooth as many of the later varieties.

EARLY MICHIGAN: One of the best second early sorts. Size medium to large, smooth, and of a deep, rich red color.

CHALK'S EARLY JEWEL: A good second early; smooth, deep red in color, good size, quality excellent, sometimes is not firm, yet it has been shipped to the Northwest by express, arriving in first class condition. Very prolific.

LIVINGSTON'S BEAUTY: Large, smooth, flesh light pink, vine large and an abundant bearer.

JUNE PINK: An extra early purple fruited tomato, ripens with Earliana or a little later; vine open, a very good bearer.

GLOBE: A new, very large purple fruited variety, of good quality, fruit uneven in size, skin tender and cracks badly in moist weather; cannot be recommended for profit.

DWARF CHAMPION: The plants are close jointed, fruit a glossy purple, very smooth, fine quality. As a cropper it is worthless on sandy soil but on a heavier soil is first class.

QUARTER CENTURY: Similar to Champion, but is bright red. Not profitable.

FORDHOOK FIRST: Not a first-early, but a good second on reasonably good soil. Some seasons it rots badly. Fruit smooth, solid, deep pink in color, fine flavor; vine strong grower, and very desirable on soil not too rich.

MAGNIFICENT: Fruit good size, smooth, perfectly solid, brilliant scarlet; not tested enough to say as yet as to the cropping quality.

ALPHA PINK: A good size pink or purple fruited variety; does not grow smooth enough to be considered as a good market variety.

IMPERIAL: Quite early, of good size, smooth, pink or purple skin, fairly solid, productive.

FIRST OF ALL: Early. Almost as early as Earliana, quite smooth, firm. A good tomato.

SUCCESS: A fine firm fleshed sort, not a good cropper, but first class quality. On heavy soils it bears well, but not on sand.

STONE: A famous main crop; tomatoes of the finest quality, red solid flesh, and on heavy soil a good bearer while on sand is only a fair cropper. Is used by some for hot house forcing.

PLENTIFUL: One of the finest tomatoes grown, fruits of large size, smooth and uniform, heavy bearer, solid flesh pink to purple in color, not extra early, but more for main crop. Very desirable.

BEEFSTEAK: A medium late variety, good bearer, rich red in color, smooth, not sufficiently tested as yet.

EARLIBELL: Not as early as claimed, nor yet as smooth as many others, in fact on rich soil it is very rough, growing too large to be of value as a market variety. Cannot be recommended.

HUMMER: A new tomato, round, large, bright red in color, very firm flesh, fine quality. It is claimed to be early, but has not proven this year, but can be classed as a second early.

MOORE'S KING OF THE EARLIES: Quite early, almost as early as Earliana, but is not as productive, nor as smooth and as firm in flesh, consequently cannot be recommended for commercial purposes.

Musk Melons.

In musk melons this season I have tested Extra Early Hackensack, Long Island Beauty, Unsworth's Perfect, Irondequoit, Ideal, Early Ripe, Gold Coin, Grand, Tip Top, Osage, Model, Grand Rapids, Burpee's Champion Market, Burrell's Gem, Watter's Solid Net Rocky Ford, Burrell's Thoroughbred Rocky Ford, and Pollock's Rust Resister Rocky Ford. The Hackensack, L. I. Beauty, and Unsworth's Perfect are large green fleshed melons of only fair quality, but quite productive, and are perhaps the best selling melons grown to-day for our Ontario markets. Apparently what is wanted is a large melon with some quality, but there is now a growing demand for something of better quality, and the Grand, Osage, Burrell's Gem and the Rocky Ford varieties appear to fill the requirements to perfection. I find however that the Gold Coin and Model and the Ideal are melons of very fine quality, and can recommend them to any one wanting something worth eating. These are all red or salmon colored fleshed, and the Ideal is the largest size of these three, being similar in size to Osage. The Grand is a new melon, red fleshed and of first class quality, ripening up early and of quite even size, making it very desirable.

Ideal: A salmon fleshed variety of fine flavor, of handsome appearance, well netted, good shipper, size similar to Osage and very much the same in appearance, but with more netting on skin. Superior.

Gold Coin: Earlier than Paul Rose, about two or three times as large, of lighter skin, wider ribbed, of deeper flesh and better quality. Fruit round to oblong, very small seed cavity, and one of the finest quality tested this year.

Model: An early melon, larger than Rocky Ford, flesh green, seed cavity small, splendid quality.

The Grand: A new melon, rich salmon flesh, early, ripens up a very even crop quickly, does not crack at blossom end like Osage, and is more desirable than that old and well known variety.

Grand Rapids: A large, oval-shaped, early, low quality melon. Productive, but not desirable in a general sense for market. Salmon fleshed.

Burrell's Gem: A new melon, from Rocky Ford, Colorado, of the finest quality. Shape oblong, flesh rich salmon color; productive. The melon is subject to cracking in wet seasons. Worthy of trial.

Watter's Solid Net Rocky Ford Cantaloupe: The finest type of Rocky Ford that I have grown here. Flesh green, deep, finest quality, seed cavity small, and as the name implies they are almost solidly netted, and not a smooth melon in a crop as far as tested. The best strain of Rocky Ford tested.

Burrell's Thoroughbred Rocky Ford: Color of flesh green, changing to light salomn at the center, seed cavity triangular, the seeds firmly held by three lobes. A good variety, but not equal to Watter's Solid Nett.

Hackensack: Extra early, several days earlier than the old Hackensack, of better quality, green flesh, very early, and a good market sort. Well netted but needs breeding up, as there are a lot of smooth melons in the crop as now grown and they are of no value for market, being flavorless.

Long Island Beauty: Similar to Hackensack in appearance but a little earlier and no better quality, but sell well in markets.

Unsworth's Perfect: A large melon of the Hackensack type, well netted throughout, flesh green, not very deep however, nor of very good quality but one of the largest selling melons on the markets to-day. As tested this year, they do not produce a large crop, but every melon was large and handsome.

Pollock's Rust Resister Rocky Ford: Seed procured from Colorado from the originator, and as tested at the Colorado Experiment Station has proven this year to resist rust or blight better than most varieties tested. The quality of the fruit is not quite equal to Watter's Solid Nett, nor is the bulk of the crop as desirable or as even in shape. Another and better year may show it up differently. It is a heavy cropper.

Early Ripe: Is an early, green fleshed, dark green skinned melon, with nothing to recommend it. The quality is poor, and the shipping qualities are no good.

Champion Market: A green fleshed variety of good quality. Productive, firm and a good shipper for Ontario Markets.

Tip Top: A salmon fleshed variety, quality good, firm flesh, a good shipper, often shipped in car-loads in bulk in Ilinois, skin is slate color, which does not make it a showy melon.

Potatoes.

Sweet potatoes are not largely grown here, but a few are growning them for their own use each year, and usually with good results. The variety that produces the largest crop is the Yellow Nansemond, while for the best quality the Jersey Sweet are much the best, being of good flavor, sweet and dry; while the other variety mentioned is somewhat inclined to have a little peculiar flavor that is not desirable, and is somewhat wet. Virginia Sweets are not much grown since the Jerseys are so much better.

Jersey Sweets: A splendid variety, fine grained flesh, sweet and delicious flavor, rather long and smooth. None better.

Yellow Nansemond: A more productive variety than Jersey Sweets, short, smooth and of chunky growth.

Up-Rivers: A strain of Jersey Sweets, short and of chunky growth, dry and sweet.

Gold Skin: Quality good, sweet, tubers short and of chunky growth.

The past season in this section has been very unfavorable for the growing of Irish potatoes. The spring season was cold, and many were lost after planting; besides some were frozen as late as July 2nd on dark soils. The blight was not serious, being largely prevented by spraying and good cultivation. The crop here is light, and towards spring car-loads will have to be brought in to supply the demand. The varieties largely grown here are, Green Mountain, Sir Walter Raleigh, Early Rose, Beauty of Hebron, Early Harvest, Bovee, Early Ohio, American Wonder, Burpee's Extra Early, Empire State, Carmen No. 1, Seneca Beauty and Banner, while a few others are grown each year for testing purposes. The Early Ohio and Burpee's Extra Early, and some Bovee are generally grown for first early and the others mentioned are grown for later crop, some preferring different varieties for different soils. For sandy soil I recommend Bovee, Burpee, Harvest and Ohio for early market.

Desirable Varieties: Moneymaker, Early Rose, World's Fair, Empire State, Early Ohio, Maule's Thoroughbred, Beauty of Hebron, Rural New Yorker, Burpee's Extra Early, Bovee, Early Harvest, American Wonder, White Elephant.

Map showing relative situations of the Ontario Fruit Experimental Stations.

APPENDIX.

FRUITS RECOMMENDED FOR PLANTING.

Explanatory Remarks.

General Lists: After testing a large number of varieties of fruit at the various fruit stations, the Board of Control has decided upon the following as the most desirable for general planting.

District Lists. The District Lists given by the various experimenters show varieties especially adapted to the sections represented by their stations.

The term "Commercial" is intended to include the varieties most desirable for market purposes, and the term "Domestic" those most desirable for home uses, either cooking or dessert.

These lists are given, as far as possible in the order of ripening.

It is realized that there are many varieties not included in these lists which may do well under special conditions, yet which are generally not considered as desirable as those mentioned.

The Board of Control recognizing the great disadvantage which faces inexperienced persons who desire to engage in fruit growing for profit, because of the very large and confusing list of varieties, has ordered the publication of select lists of tested varieties which shall serve as a guide to intending planters.

GENERAL LISTS

Of the most valuable varieties of fruits recommended to be grown for market in the Province of Ontario, approved by the Board of Control of the Ontario Fruit Stations.

APPLES.

Summer.

Astrachan: Adapted to all sections except in the extreme north.

Duchess: Adapted to all sections.

Fall.

Gravenstein: Adapted to all sections except the St. Lawrence River and other northerly portions of the Province.

Wealthy: Particularly valuable for northern sections.

Alexander: Especially for northern districts.

McIntosh: Adapted especially to the St. Lawrence River district, but can be grown over a much wider area.

Fameuse: Adapted especially to the St. Lawrence River district, but succeeds well over a much wider area.

Blenheim: Adapted to all sections except the St. Lawrence River district and other northerly portions of the Province.

Winter.

KING: Adapted only to the best apple sections, and succeeds best when top grafted on hardy stocks.

HUBBARDSTON: Adapted to the best apple sections.

GREENING: Adapted to the best apple sections.

BALDWIN: Succeeds best on clay land, and is adapted to the best apple districts.

NORTHERN SPY: Adapted to the best apple districts, but can be grown with success farther north by top-grafting on hardy stocks. This is also a good method of bringing it into early bearing.

ONTARIO: An early and abundant bearer, but short lived. Recommended as a filler among long lived trees. Adapted to same districts as Northern Spy, which it somewhat resembles.

STARK: Adapted to best apple districts.

VARIETIES ESPECIALLY ADAPTED TO HOME USE.

Summer.

TRANSPARENT: Adapted to all sections.

PRIMATE: Adapted to best apple sections.

SWEET BOUGH: Adapted to best apple sections.

DUCHESS: Adapted to all sections.

Fall.

CHENANGO: Adapted to best apple sections.

GRAVENSTEIN: Adapted to best apple sections.

WEALTHY: Especially adapted to northern sections.

McINTOSH: Especially adapted to northern sections.

FAMEUSE: Especially adapted to northern sections.

BLENHEIM: Adapted to best apple sections.

Winter.

KING: Adapted to best apple sections. Should be top grafted.

WAGENER: Adapted to best apple sections.

SWAYZIE: Adapted to all sections except most northerly.

GREENING: Adapted to best apple districts.

TOLMAN: Adapted to best apple districts.

NORTHERN SPY: Adapted to best apple districts, but will succeed farther north if top grafted.

HARDY VARIETIES RECOMMENDED FOR SECTIONS NORTH OF LATITUDE 46 DEGREES.

Summer.

Transparent, Lowland Raspberry, Charlamoff.

Fall and Winter.

Duchess, Wealthy, Hibernal, Longfield, Patten, Whitney, Hyslop.

Crabs Suitable for the Whole of the Province.

Whitney: A large crab of high quality, suitable for planting in the extreme north where other apples will not succeed. May be used for dessert or cooking.
Martha: An early crab of fair quality.
Transcendent: Yellowish crab, season early autumn.
Hyslop: Dark, rich, red crab, of late season, quality only fair.

Blackberries.

Agawam, Snyder, and for southern sections, Kittatinny.

Cherries.

Hardy: Orel, Early Richmond, Montmorency, Russian 207.

Currants.

Black: Black Victoria, Champion, Lee, Naples, Saunders.
Red: Cherry, Fay, Pomona, Red Cross, Victoria, Wilder.
White: White Grape.

Gooseberries.

Pearl, Downing, Red Jacket. Whitesmith is one of the best English varieties, but is almost valueless on some soils and in some localities owing to mildew.

Grapes.

Commercial and Domestic:
Black: Moore, Campbell, Worden, Concord, Wilder.
Red: Delaware, Lindley, Agawam, Vergennes.
White: Niagara, Diamond.
For Northern Sections:
Black: Champion, Moore, Campbell, Worden.
Red: Moyer, Brighton, Delaware, Lindley.
White: Winchell, Diamond.

Peaches.

Commercial:
Sneed: Whitefleshed, clingstone, quality only fair, earliest of all.
Alexander: Whitefleshed, clingstone.
St. John: Yellowfleshed, freestone, quality good.
Mountain Rose: Whitefleshed, freestone, quality very good.
Early Crawford: Yellowfleshed, freestone, quality very good.
Champion: Whitefleshed, freestone, quality very good, for home use, or near markets.
Brigdon: Yellowfleshed, freestone, quality very good.
Fitzgerald: Yellowfleshed, freestone, quality very good.
Reeves: Yellowfleshed, freestone, quality fair, large size.

Elberta: Yellowfleshed, freestone, quality fair, good for long distance shipments.

Oldmixon: Whitefleshed, freestone, quality good.

Stevens: Whitefleshed, freestone, quality good.

Smock: Yellowfleshed, freestone, quality fair, very late, good shipper.

Domestic:

Hynes, St. John, Early Crawford, Oldmixon, Longhurst, Stevens.

Pears.

Commercial: Giffard, Clapp, Bartlett, Boussock, Flemish (hardy, subject to spot), Howell, Louise, Duchess, Bosc, Clairgeau, Anjou, Kieffer.

Domestic: Summer Doyenne, Giffard, Bartlett, Flemish (for the north), Sheldon, Seckel, Bosc, Anjou, Lawrence, Josephine, Winter Nelis.

Plums.

Commercial and Domestic:

American: These are extremely hardy and are desirable where the European and Japanese varieties cannot be grown: Aitkin, Cheney, Bixby, Mankato, Wolf, Hawkeye, Stoddard.

European: Bradshaw, Imperial Gage, Gueii, Shipper's Pride, Lombard (liable to over bear, requires thinning), Quackenboss, Yellow Egg, Grand Duke, Golden Drop (Coe), Reine Claude (one of the best for canning).

Japanese: These are apparently quite as hardy as the European varieties: Red June, Abundance, Burbank, Chabot, Satsuma (red fleshed, desirable for canning).

Quinces.

Fuller, Orange (the leading market variety in Ontario), Champion (for Southern Ontario only as it ripens too late for other sections).

Raspberries.

Black: Hilborn, Older, Gregg, Smith Giant.

Purple: Columbian, Shaffer.

Red: Marlboro, Herbert, Cuthbert.

White: Golden Queen.

Strawberries.

Commercial: Beder Wood (P.), Splendid (P.), Warfield (Imp.), not suited to light sandy soil, Greenville (Imp.), Williams (Imp.), Saunders (P.), Sample (Imp.), Irene (Imp.), Buster (Imp.).

Domestic: Excelsior (P.), Splendid (P.), Senator Dunlop (P.), Ruby (P.), Bubach (Imp.), Lovett (P.), Irene (Imp.), Belt (P.).

Note.—These varieties somewhat in order of their ripening season.

In selecting varieties for planting, perfect-flowered varieties should be included to fertilize those having imperfect flowers.

DISTRICT LISTS OF FRUITS.

Recommended by the experimenters for planting in the districts represented by their respective stations.

NIAGARA DISTRICT.

(Including Niagara peninsula from Niagara river to Hamilton).

By Linus Woolverton, Grimsby, Ont.

Apples.

Commercial: Astrachan, Duchess, Gravenstein, Alexander, Blenheim, King, Greening, Baldwin, Spy.

Domestic: Early Harvest, Sweet Bough, Duchess, Chenango, Gravenstein, Shiawassee, Fall Pippin, Fameuse, Swayzie, Wagener, Esopus (Spitzenburg), Tolman.

Blackberries.

Commercial and Domestic: Kittatinny (largest berry, but bush subject to orange rust); Agawam.

Cherries.

Commercial: Wood, Knight, Napoleon, Tartarian, Dyehouse, Montmorency, Elkhorn, Windsor, English Morello, Bessarabian.

Domestic: May Duke, Cleveland, Knight, Elton, Tartarian, Hortense, Choisy, Black Eagle, Mezel, Royal Duke.

Currants.

Red: Cherry, Fay, Victoria, Wilder.

White: White Grape.

Black: Saunders, Lee's Prolific.

Peaches.

Commercial: Sneed, Alexander, Greensboro, Triumph, St. John, Early Crawford, New Prolific, Champion, Elberta, Willet, Smock.

Domestic: Rivers, Hynes, St. John, Early Michigan, Lewis, Crosby, Champion, Reeves, Wonderful, Jacques Rareripe, Wheatland, Longhurst.

Plums.

Commercial: Red June, Burbank, Bradshaw, Chabot, Gueii, Golden Drop (Coe), Quackenboss, Satsuma, Reine Claude.

Domestic: Abundance, Washington, Yellow Egg, Shropshire, Quackenboss, Satsuma, Reine Claude.

Quinces.

Orange.

By Murray Pettit, Winona, Ont.

Peaches.

Commercial: Alexander, Yellow St. John, Early Crawford, New Prolific, Elberta, Smithson, Yellow Rareripe, Lemon Free, Smock.

PLUMS.

Commercial: Burbank, Bradshaw, Lombard, Grand Duke, Reine Clude, Monarch.

GRAPES.

Commercial:
Black: Champion, Campbells, Worden, Wilder, Concord.
Red: Delaware, Lindley, Agawam, Vergennes, Catawba.
White: Niagara, Diamond.
Domestic:
Black: Black Delaware, Early Dawn, Mills.
Red: Delaware, Jefferson, Moyer.
White: Lady, Winchell.

PEARS.

Commercial: Giffard, Bartlett, Louise, Howell, Anjou, Duchess (Dwarf), Kieffer.

LAKE ERIE DISTRICT.

(Including approximately the northern shore of Lake Erie from the eastern boundary of Elgin County to the Detroit River and the eastern shore of the River St. Clair and Lake Huron to the northern boundary of Lambton County.

By J. L. Hilborn, Leamington, Ont.

APPLES.

Commercial: Duchess, Blenheim, Baldwin, Stark, Hubbardston, Spy.
Domestic: Transparent, Golden Sweet, Duchess, King, Tolman, Spy.

BLACKBERRIES.

Snyder, Eldorado.

CHERRIES.

Early Richmond, Montmorency.

CURRANTS.

Commercial:
Red: Wilder, Raby Castle.
Black: Lee, Black Victoria.
White: White Grape.

GOOSEBERRIES.

Pearl, Downing, Whitesmith.

GRAPES.

Commercial:
Black: Champion, Wilder, Concord.
Red: Lindley, Brighton, Catawba.
White: Niagara.

Domestic:
Black: Moore's Worden.
White: Diamond.
Red: Delaware, Brighton, Jefferson.

PEACHES.

Commercial: Dewey, St. John, Brigden, New Prolific, Engol, Kalamazoo, Elberta, Banner and Gold Drop.
Domestic: Dewey, Mountain Rose, Engol, Old Mixon, Crosby, Gold Drop.

PEARS.

Bartlett, Duchess, Anjou.

PLUMS.

Burbank, Bradshaw, Lombard, Imperial Gage, Reine Claude.

RASPBERRIES.

Commercial:
Black: Hilborn, Palmer.
Red: Marlboro, Cuthbert.

Domestic:
Black: Hilborn, Palmer.
Red: Turner.
Yellow: Golden Queen.

BURLINGTON DISTRICT.

(The western shore of Lake Ontario, between Hamilton and Toronto).

By A. W. Peart, Burlington, Ont.

APPLES.

Commercial: Astrachan, Duchess, Wealthy, Ribston, Blenheim, King, Greening, Baldwin, Spy.
Domestic: Astrachan, Sweet Bough, Gravenstein, Wagener, Seek, Golden Russet.

BLACKBERRIES.

Commercial and Domestic: Snyder, Ancient Briton, Western Triumph, Agawam.

CHERRIES.

May Duke, Windsor, Early Richmond, Montmorency, English Morello.

CURRANTS.

Commercial:
Black: Lee, Naples, Saunders, Collin's Prolific.
Red: Cherry, Fay, North Star, Prince Albert, Victoria, Wilder.
White: White Grape, Imperial.

GRAPES.

Black: Moore's Early, Worden, Concord.
Red: Delaware, Lindley, Massassoit.
White: Niagara, Diamond.

PEACHES.

Sneed, Alexander, St. John, Early Crawford, Champion, Elberta, Smock.

PEARS.

Commercial: Wilder, Clapp, Bartlett, Boussock, Louise, Duchess (dwarf), Anjou, Kieffer, Winter Nelis, Easter Beurre.
Domestic: Wilder, Bartlett, Louise, Anjou, Winter Nelis.

PLUMS.

Commercial:
European: Bradshaw, Niagara, Imperial Gage, Lombard, Yellow Egg, Glass, Reine Claude, Staunton.
Japan: Red June, Abundance, Burbank, Chabot, Satsuma.
Domestic: Saunders, Bradshaw, Imperial Gage, Smith Orleans, Lombard, Yellow Egg, Satsuma, Reine Claude.

RASPBERRIES.

Marlboro, Cuthbert, Herbert.

GOOSEBERRIES.

Pearl, Downing, Red Jacket.

STRAWBERRIES.

Beder Wood, Senator Dunlop, Williams, Gibson, Glen Mary, Leader.

NOTE.—There are doubtless other varieties of fruits, which will succeed as well, or perhaps better, in different localities of this district, while, on the other hand, some of the above varieties may not be profitable in certain sections.

The adaptability of some fruits is very local indeed.

LAKE HURON DISTRICT.

(Including the east shore of Lake Huron from the northern boundary of Lambton County to Owen Sound).

By A. E. Sherrington, Walkerton, Ont.

APPLES.

Commercial: Duchess, McIntosh, Fameuse, Blenheim, King, Greening, Baldwin, Tolman, Northern Spy, Golden Russet, Ben Davis, Stark.
Domestic: Astrachan, Duchess, McIntosh, Fameuse, Blenheim, King, Greening, Tolman, Northern Spy.

BLACKBERRIES.

Agawam, Eldorado.

CHERRIES.

English Morello, Montmorency.

CURRANTS.

Red: Wilder, Red Cross, Fay, Prince Albert.
Black: Champion, Naples, Saunders, Victoria.
White: Grape, Imperial.

GOOSEBERRIES.

Downing, Pearl.

GRAPES.

Champion, Concord, Moore, Worden, Niagara.

PEARS.

Clapp, Bartlett, Louise, Clairgeau, Anjou, Lawrence.

PLUMS.

Burbank, Field, Gueii, Bradshaw, Imperial Gage, Quackenboss, Shipper's Pride, Purple Egg, Lombard, Monarch, Yellow Egg, Grand Duke.

RASPBERRIES.

Black: Hilborn, Conrath.
Red: Marlboro, Herbert, Cuthbert.

GEORGIAN BAY DISTRICT.

(Southern Shore of the Georgian Bay from Owen Sound to Midland).

J. G. MITCHELL, CLARKSBURG, ONT.

For Commercial and Domestic purposes.

APPLES.

Summer: Red Astrachan, Duchess.
Fall: Gravenstein, St. Lawrence, Wealthy, Alexander, McIntosh, Twenty-ounce.
Winter: Baldwin, Spy, King, R. I. Greening.

CHERRIES.

Early Richmond, May Duke, Montmorency, Olivet.

CURRANTS.

Cherry, Black Champion, Fay's Prolific, Lee's Prolific.

GOOSEBERRIES.

Red Jacket, Downing, Houghton, Pearl, Industry.

Grapes.

Champion, Diamond, Green Mountain, Niagara, Salem.

Peaches.

Fitzgerald, Crawford's Early, Crawford's Late, Champion, Crosby, Triumph. Tyhurst.

Pears.

Bartlett, Clapp's Favorite, Flemish Beauty, Anjou, Duchess, Howell, Bartlett-Seckel, Beurre Clairgeau, Louise Bonne de Jersey, Kieffer.

Plums.

Red June, Washington, Bradshaw, Imperial Gage, Quackenboss, Arch Duke, Monarch, Yellow Egg, Coe's Golden Drop, Lombard, Reine Claude, Prune d'Agen.

Raspberries.

Red: Marlboro, Cuthbert, Loudon.
Black: Older, Hilborn, Gregg.

LAKE SIMCOE DISTRICT.

(Including the country bordering on Lake Simcoe.)

By G. C. Caston, Craighurst, Ont.

Apples.

Commercial: Duchess, Peerless, Alexander, Wolf, Blenheim, Pewaukee, Stark, Baxter, Seek, and the following if top-worked on hardy stocks: Greening, King, Ontario, Baldwin, Spy.

Domestic: Astrachan, Louise, St. Lawrence, Fameuse, McIntosh, King, Spy.

Blackberries.

Commercial and Domestic: Agawam, Eldorado.

Cherries.

Commercial and Domestic: Orel 24, Ostheim, Lithaur, Russian 207, Montmorency, Bessarabian, Dyehouse, English Morello.

Currants.

Fay, Versaillaise, Cherry, White Grape, Black Naples, Victoria.

GOOSEBERRIES.

Pearl, Downing.

GRAPES.

Moyer, Moore's Early, Diamond, Green Mountain, Campbell's Early.

PEARS.

Bartlett, Clapp.

PLUMS.

Staunton, Burbank.

RASPBERRIES.

Herbert (Early), Marlboro, Cuthbert.

GUELPH DISTRICT.

(Including the high inland Counties of southwestern Ontario, i.e., Wellington, north Waterloo, northeasterly Perth, southerly part of Grey, southwesterly part of Dufferin, and northwesterly section of Peel and Halton.)

List recommended by Prof. H. L. Hutt, O.A.C., Guelph, Ont.

APPLES.

Commercial: Duchess, Alexander, Trenton, Wealthy, Fameuse, McIntosh, Salome, Spy.
Domestic: Astrachan, Duchess, Wolf River, Wealthy, Fameuse, McIntosh, Bellflower, Tolman.
Crab Apples: Whitney, Martha.

BLACKBERRIES.

None.

CHERRIES.

Early Richmond, Montmorency

CURRANTS.

Red: Red Cross, Victoria, Fay.
White: White Grape.
Black: Black Victoria, Champion, Saunders.

GOOSEBERRIES.

Pearl, Red Jacket, Whitesmith.

GRAPES.

Black: Moore's Early.
Red: Moyer.
White: Winchell.

PEACHES.

None.

PLUMS.

Bradshaw, Imperial Gage, Shipper's Pride, Lombard, Reine Claude, Glass.

PEARS.

Clapp's Favorite, Bartlett, Flemish Beauty, Seckel, Sheldon, Anjou.

RASPBERRIES.

Red: Marlboro, Herbert, Cuthbert.
Purple: Columbian.
White: Golden Queen.
Black: Older, Smith's Giant.

STRAWBERRIES.

Splendid, Warfield, Fountain, Ruby, Parsons, Williams, Senator Dunlop.

BAY OF QUINTE DISTRICT.

(Including the northern shore of Lake Ontario, from Toronto to Kingston.)

BY W. H. DEMPSEY, TRENTON, ONT.

APPLES.

Commercial: Duchess, Gravenstein, Trenton, Alexander, Wealthy, Fameuse, McIntosh, King, Greening, Baldwin, Ontario, Seek, Spy, Tolman, Ben Davis, Stark.
Domestic: Benoni, Primate, Gravenstein, Fameuse, McIntosh, Grimes, Greening (R.I), Ontario, Spy, Tolman, Swayzie.

PEARS.

Commercial and Domestic: Giffard, Tyson, Clapp, Boussock, Hardy, White Doyenne, Dempsey, Bosc, Clairgeau, Goodale, Lawrence, Josephine.

CHERRIES.

Commercial and Domestic: Early Richmond, Montmorency.

ST. LAWRENCE DISTRICT.

Including the Valley of the St. Lawrence River from Kingston to Cornwall.

BY HAROLD JONES, MAITLAND, ONT.

APPLES.

Commercial: Duchess, Alexander, Wolf, Scarlet Pippin, Fameuse, McIntosh, Baxter, Milwaukee, Golden Russet.
Domestic: Transparent, Brockville Beauty, Scarlet Pippin, Fameuse, McIntosh, Blue Pearmain, Golden Russet, Yellow Bellflower.

Cherries.

Commercial and Domestic: Early Richmond, Montmorency, Orel, English Morello.

Pears.

Domestic: Clapp, Flemish, Ritson.

Plums.

Domestic:
European: Gueii, Lombard, Shipper's Pride, Glass.
Japan: Red June, Burbank.
American: Milton, Whitaker, Hammer.

OTTAWA DISTRICT.

Including Ottawa Valley, south of latitude 46 degrees.

By W. T. Macoun, Horticulturist, Experimental Farm, Ottawa.

Apples.

Commercial and Domestic:
Summer: Transparent, Lowland Raspberry, Duchess.
Autumn: St. Lawrence, Wealthy, Alexander.
Early Winter: McIntosh, Fameuse, Wolf River.
Winter: Milwaukee, Baxter, Scott, Winter.
Additional varieties suggested for domestic use.
Summer: Langford Beauty.
Autumn: Peach of Montreal, McMahon.
Winter: Swayzie, Pewaukee, Golden Russet, Rufus.

Crab Apples.

Domestic only: Whitney, Martha, Hyslop.

Blackberries.

Domestic only: Agawam, Snyder.

Cherries.

Domestic only: Orel, Vladimir, Minnesota Ostheim, Cerise d'Ostheim.

Currants.

Commercial and Domestic:
Black: Saunders, Collins Prolific, Black Victoria.
Red: Pomona, Victoria, Red Dutch, and Wilder in most favored parts.
White: White Grape.

GOOSEBERRIES.

Commercial and Domestic: Pearl, Downing, Red Jacket.

GRAPES.

Black: Early Daisy, Manito, Moore's, Worden, Wilder.
Red: Moyer, Brighton, Delaware, Lindley.
White: Golden Drop, Winchell, Diamond.

PEARS.

Commercial and Domestic: Flemish in most favored parts.

PLUMS.

Commercial and Domestic:
Americana and Nigra: Aitkin, Bixby, Mankato, Cheney, Wolf, Admiral Schley, Brackett, Hawkeye, Stoddard.
European-Domestic: Early Red (Russian) Mount Royal, Raynes, Glass, Montmorency, Perdrigon.

RASPBERRIES.

Commercial and Domestic:
Black: Hilborn, Older.
Red: Marlboro, Herbert.
Yellow: Golden Queen.

STRAWBERRIES.

Commercial: Splendid (P.), Beder Wood (P.), Warfield (Imp.), not suited to light soil, Greenville (Imp.), Pocomoke (P.), Sample (Imp.), Buster (Imp.).
Domestic: Excelsior (P.), Splendid (P.), Senator Dunlop (P.), Lovett (P.), Bubach (Imp.), Belt (P.).

ALGOMA DISTRICT.

The islands Manitoulin and St. Joseph, and a limited portion of the northern and eastern shore of the Georgian Bay.

BY CHAS. YOUNG, RICHARDS LANDING, ONT.

APPLES.

Commercial and Domestic:
Summer: Yellow Transparent, Charlamoff, Astrachan.
Fall: Duchess, Peach, St. Lawrence, Gideon, Colvert, Basil the Great.
Early Winter: Longfield, Wealthy, Alexander, Wolf River, Walbridge.

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THIRD ANNUAL REPORT

OF THE

Ontario Vegetable Growers' Association

1907

(PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE)

PRINTED BY ORDER OF

THE LEGISLATIVE ASSEMBLY OF ONTARIO

TORONTO:
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty
1908.

Printed by WARWICK BRO'S & RUTTER, Limited, Printers,
TORONTO.

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To the Honorable SIR WILLIAM MORTIMER CLARK, K.C.,
Lieutenant-Governor of the Province of Ontario.

May it Please Your Honor:

I have the pleasure to present herewith for the consideration of your Honor the Report of the Ontario Vegetable Growers' Association for 1907.

Respectfully yours,

NELSON MONTEITH,
Minister of Agriculture.

Toronto, 1908.

Ontario Vegetable Growers' Association.

OFFICERS FOR 1908.

President ..... R. H. Lewis, Hamilton
1st Vice-President ..... Thos. Delworth, Weston.
2nd Vice-President ..... I. A. Farquharson, Ottawa
Secretary-Treasurer ..... J. Lockie Wilson, Toronto

Directors.

W. A. Emory, Aldershott.
R. J. Bushell, Williamsville.
F. F. Reeves, Humber Bay.
J. G. Brown, Humber Bay.
C. Aymer, Humber Bay.
E. K. Purdy, Cataraqui.
Jas. Dandridge, Mimico.
H. Broughton, Sarnia.
W. W. Weaver, Chatham.
E. W. Dillon, Ojibwa.
Thos. Wistow, London.

Ontario Vegetable Growers' Association.

THIRD ANNUAL CONVENTION.

The third annual Convention of the Ontario Vegetable Growers' Association was held in the City Hall, Toronto, November 14th and 15th, 1907, and demonstrated that, although the growth of the organization has been rapid, it is substantial, and that the Association, eventually, will be of incalculable benefit to the vegetable growers of Ontario. The industry is only in its infancy in Ontario, and as the cities increase in population and wealth, the business will assume large proportions compared to what it is at present. There was a good attendance at the meetings, which were presided over by the President, Mr. R. J. Bushell, of Williamsville.

REPORT OF THE SECRETARY-TREASURER.

By H. B. Cowan, Toronto.

On behalf of the Directors of the Ontario Vegetable Growers' Association, I beg to report that during the year ending November 30th, 1907, the Association has continued to prosper, and has succeeded in promoting much work that it is believed will be of decided benefit to the vegetable growers of this Province as a whole. The membership continues large and very representative. Two branches have ceased to exist, those at St. Catharines and Brantford. The members of the branch at St. Catharines were nearly all fruit growers, as well as vegetable growers, and this year they decided to affiliate with the Ontario Fruit Growers' Association. These losses have been more than offset by the establishment of three new branches, one at London, one at Guelph, and one at Ojibwa. The Association now has eleven branches, as compared with ten a year ago, and a total membership of 476. The branches and their membership are as follows:—

Odd members, 5; Chatham, 13; Scotland, 15; Tecumseh, 15; Guelph, 18; Sarnia, 23; London, 30; Kingston, 33; Ottawa, 34; Ojibwa, 40; Hamilton, 56; Toronto, 194. It will be noticed that the branches at Toronto and Hamilton, continue to have the largest membership, and that the branch at Ojibwa is the third strongest in the Province. As compared with last year, the Toronto branch has lost 8 members, Hamilton 25, Ottawa 5, Sarnia 6, Scotland 11, Chatham 13, and Tecumseh 1, while the Kingston branch has increased its membership by 6. The first novelty connected with the organization of the branches having worn off, a certain falling off in the membership was to be expected. It is to be regretted, however, that so many branches report a decrease in membership. An earnest effort should be made next year to increase the membership of the Association all along the line.

During the year, picnics were held by the London, Hamilton, Toronto, and Guelph branches. These were well attended and greatly enjoyed by the members. The picnics at Hamilton and Toronto were honored by having present Mr. R. J. Bushell, who is the President of the Association. At each

of these picnics, the Ontario Association offered books on vegetable growing as prizes in the races. The holding of such picnics is an excellent line of work, which it would be well for other branches to adopt.

During the year, meetings of the full board of Directors were held on March 5, and November 13, and meetings of the executive committee on March 15, and September 3. In order that our members may keep posted in regard to the work done at the meetings of the Board of Directors and of the Executive Committee, it has been decided to publish these reports in full, in our Annual Report of the Association.

Early in the year, a deputation composed of the Directors of the Association, waited on Hon. Nelson Monteith, the Minister of Agriculture for Ontario, and asked that the grant from the Government to the Association should be increased from $600 to $1,000 a year. This deputation pointed out that the Ontario Fruit Growers' Association received an annual grant of $1,800. Although your Directors made a strong plea for increased financial assistance, their efforts proved unsuccessful. It is hoped, however, that the grant to the Association will be increased in the near future.

A deputation from your Association including the president, Mr. R. J. Bushell, of Williamsville, and Mr. T. Delworth, of Weston, assisted by a number of the members of the Ottawa branch, waited on Hon. William Paterson, Dominion Minister of Customs, and asked that officials be appointed to examine the vegetables imported from the United States. It was requested that these officials should be given power to prevent the importation of vegetables that would be sold in Canada at prices lower than those at which the same vegetables were sold at the point of production. The deputation urged that Ontario vegetable growers should be protected from importations of growers in the United States who used Canada as a dumping ground. Hon. Mr. Paterson evinced much interest in the case made by the representatives of the Association, and intimated that the Department would take steps to grant their requests.

As a means of increasing the membership of the Association and of encouraging the branch organizations to do better work, it was decided in March to offer prizes to the secretaries of the branches who sent in the largest number of new members during the year, and also to the secretaries whose annual report showed their branches to have accomplished the most valuable work during the year. These prizes have not been awarded as yet. Several reports have been received, and show that a number of the branches have accomplished excellent work.

During the summer, a Toronto newspaper charged the Canadian Canners', Limited, of Hamilton with being a combine in the restraint of trade. Realizing that if these charges were true, the vegetable growers who raise vegetables for the canning factories were more or less at the mercy of this combine, your directors appealed to the Department of the Attorney-General of Ontario, and asked that these charges should be investigated. Assurance was received that the Attorney-General's Department would have these charges investigated this fall, when other cases of a similar nature would be tried before the courts.

It was decided early in the year to organize the vegetable growers who live in the vicinity of the canning factories. A Committee from your directors waited on the Ontario Department of Agriculture regarding this matter, and were informed that the Department had been conducting an investigation, and purposed publishing a very complete bulletin relating to the canning industry in Ontario. The Ontario Department of Agriculture has the names of a number of vegetable growers living in the vicinity of the

various canning factories throughout the Province. Your Association purposes corresponding with these growers, and taking steps that may be necessary to organize branches of the Ontario Vegetable Growers' Association and to assist the growers to secure better prices for their crops.

During the year, copies of two bulletins, one on "Celery" by W. R. Beatty of the U.S. Department of Agriculture, and one on the "Marketing of Fruit and Truck Crops," by the Maryland Experiment Station, were purchased and were sent to every member of the Association. A number of our members have expressed their pleasure on the receipt of these bulletins, and believe that this is a valuable line of work for the Association to follow.

As was done during the season of 1906, your directors engaged crop correspondents from the various sections of the Province. These correspondents reported monthly. Summaries of their reports were sent to a number of the leading city and agricultural papers throughout the Province, and were invariably given considerable prominence. More detailed reports were published monthly in the official organ of the Association. These reports are much appreciated, and it is believed that this work will be continued, and if possible extended, next year.

At a meeting of the Directors of the Association held in Toronto early in November, a deputation was appointed to wait on Hon. Nelson Monteith. This deputation asked that vegetable growers shall be given representation on the Board of Control of the new Fruit and Vegetable Experiment Station in the Niagara district; that legislation be introduced into the Ontario Legislature that will make seed firms responsible for the quality and germinating power of the seeds they sell, in order that the vegetable growers may be protected from loss from that source; and third, that the Ontario Department of Agriculture take steps to ascertain the number of people in Ontario engaged in the vegetable industry, the value of their land, the value of the crops they produce, and other similar information. It is expected that much good will result from this interview.

During the coming winter it is intended that competent speakers shall attend meetings of the various branches and give addresses on the subjects relating to vegetable growing. Any branches that desire to have a special speaker can arrange for one to be sent to them free of cost, by applying to the Provincial Association.

The annual convention of the Association and annual exhibition were held in Toronto, at the time of the Ontario Horticultural Exhibition, November 12-16, 1907. While the attendance at the various sessions of the convention was not large, much interest was manifest. It is believed that the reports of the papers read and the discussions that took place, which will be printed, will be productive of much good. The exhibition of vegetables was the largest and best ever made in the Province. Your directors feel that much good work has been accomplished during the year, and the future of the Association is bright.

FINANCIAL STATEMENT

FOR THE YEAR ENDING, NOV. 30, 1907.

Receipts.		*Expenditures.*	
Balance on hand, Dec. 1, 1906..	$61 59	Official organ	$238 00
Government grant	600 00	Committee expenses	140 60
Membership fees	240 50	Essays	5 10
Entry fees, Ont. Hort'l. Exhibition, 1906-1907	85 70	Crop reports (1906)	14 90
Interest	4 95	Printing	41 65
		Organization expenses	32 60
		General expenses (stamps, telegrams, telephones,)	75 85
		Salaries, officers	65 00
		Travelling expenses	51 90
		Convention expenses (1906)	45 00
		Stationery	18 50
	$992 74		$729 10
		Balance on hand, Nov. 30, 1907...	263 64
		Total	$992 64

H. B. COWAN,
Secretary-Treasurer.

Audited and found correct, P. W. HODGETTS.

PRESIDENT'S ADDRESS.

BY R. J. BUSHELL, WILLIAMSVILLE.

As president of the Ontario Vegetable Growers' Association, it gives me great pleasure to welcome you to this, our third annual convention. It will not be necessary for me to go into the details of the work we have done during the past year, beyond saying that we have several reasons to be satisfied with the work which has been performed by the directors and our executive.

We approached the Dominion Government last year, and after laying the matter before them, they very kindly gave us certain protection on the importation of some of our products. Those of us who are familiar with the matter, know that this protection has increased our sales and helped us along more than we anticipated. That was good work on behalf of the Vegetable Growers' of the Dominion of Canada. To impress that fact, I would like to refer to an incident that occurred in Kingston. A year ago last spring, one of our vegetable growers was coming down one of the streets of that city. A merchant, who makes it a practice to meet the gardeners and fruit men, stopped his waggon, looked into it, and then said, that there was not very much he cared about buying that morning. The gardener said, "I have got my first pick of tomatoes, don't you want some?" The merchant said, "What do you want for them?" and the gardener replied, "75c.". The merchant replied, "I would not take them if you were to give them to me for 7½cts.; my shop in Kingston is full of them." The market gardener came to me with his little complaint, and of course, I sympathized with him.

This year, the same gardener was coming down Brock Street, and he met this same merchant, and the very first thing the merchant spied was the first pick of tomatoes. "Hello," says he, "you have got some tomatoes, what do you want for them?" The gardener replied, $1.25." "Run them in as fast as you can," said the merchant.

Now, a year ago when he asked 75 cents for them, he could not sell them. This year he asked $1.25, and he could not deliver them fast enough. Last year the merchant didn't want them at 7½ cents, and this year he was glad to get them at $1.25. The gardener said to me, "I made enough to pay for half my membership fee to the association on that one basket of tomatoes," and that one thing shows what our organization, and a little stick-to-it-iveness, have done. (Applause.)

Our membership is about the same as last year; I regret that we have not been able to increase it. Our grant has not been as large as we would like, but we expect to get it increased. Longfellow says:

"Whene'er a noble deed is wrought,
Whene'er is spoken a noble thought,
Our hearts in glad surprise
To higher levels rise."

I think that applies to the Vegetable Growers' Association—that we have wrought a noble work, and that we have spoken a noble thought, and that our hearts have risen in glad surprise to higher levels. When we see the efforts put forward by the members of this organization, and the way the Minister of Agriculture, and others are giving us a lifting hand, we ought to be more than delighted. I think, from the trend of things, that the vegetable growers are going to climb up the hill of fame. It just requires a little stick-to-it-iveness, and we will develop this industry more than we ever dreamed of.

GREEN-HOUSE CONSTRUCTION FOR VEGETABLE GROWERS.

By J. D. Fraser, Leamington, Ont.

The growing of vegetables in Essex County is not a business of choice with us, but of necessity. The fruit industry, for years, was the main occupation in the section along the shores of Lake Erie, where I live. Great areas were planted in peach trees, and a great many growers had all that they were worth invested in the business. Then a frost came and wiped out the orchards. We then began to look for something else to grow in with the peach trees, as a side line. With that end in view, we put up some small green-houses in a very modest way, and began growing tomatoes, which proved very profitable. As a rule, our tomatoes mature about two or three weeks earlier than those grown in any other part of the Dominion, and, therefore, we were able to sell them at a good price. We again replanted our peach orchards, and about five years ago they were cleaned out a second time, and thus we had to go into vegetable growing on a large scale. Our first houses were small, and were not convenient. The stress of the business made it necessary to improve them. We find it important that the green-house shall be located as convenient to the dwelling house as possible, because it is something that has to be looked after very closely. If it is far away from his dwelling house a grower is much hampered.

In our section, we have strong winds from the south-west that come across the lake. We like to have our green-houses sheltered from these winds, because they are easier to heat, and it is easier on the house. In no case, however, is it advisable, either for defence or protection, to exclude the house from all the benefit of the sun-light; we want every possible ray of sunlight.

Our first houses were built of wood and glass chiefly, and their life was very short. I know one that was put up that began to decay the next year. When there is any chance for the water to lodge, the timber begins to go down at once, and for that reason we have discarded the wood as much as possible. We are using cement for the houses. It is cheap, and once constructed, it does not rot out. For supports we use gas pipes set in cement, being very careful to place a pole six inches below the ground to keep the gas pipe from rotting off at the surface.

In our section, we have a great deal of chestnut. I do not know whether or not, it is as good as cypress, but we find cypress to be good and very much better than pine, and I think that the life of chestnut is two or three times as long as pine.

Q.—How does it compare with the price of cypress?

A.—I do not know, we can buy it at very reasonable prices. The next material is paint. We should never put up any timber in a green-house without first painting it; that is very important. There has been considerable discussion and difference of opinion between green-house growers, as to the kind of glass to use, whether to use butted glass or lipped glass. If you use lipped glass, you must lay it in putty; if the glass is quite square and well cut, butted glass is all right. If the glass does not fit, it will leak, and leaks are injurious. I think 20×20 is about the right size to use.

Mr. Delworth, Weston: How heavy do you have the bars?

A.—About $2\frac{1}{2}$ inches, I think, is the standard; it depends somewhat on the system of construction used. We talk about green-houses for vegetable growing, and from a vegetable grower's standpoint. I would not build a house over from 80 to 100 feet, in no case more than 100 feet. My reason for that is, that if a house is too wide, it is hard to get enough air into it, and in order to finish vegetable plants in the house, they have to get a free circulation of air or they will be too soft.

Q.—How do you construct the roof?

A.—We built our last house 14 ft., ridge and furrow.

Q.—You have four or five houses that width?

A.—Yes, we have the glass laid east and west, or north and south; we have a house each way. The east house, built a couple of years ago, is running north and south, with the sun striking on the side in the morning, and in the evening on the other side. The house I built this spring is in shorter spans of 14 feet, and set the other way. Where the house ends there is a glass slide of about three feet in six, and we can open this sash on the south and ventilate, and we can also open this sash at the top. In May and June, when it is very hot and a current of air comes in, the fresh air comes in at the bottom and the hot air goes out at the top. It is as comfortable in the house on a hot day as outside. We drive our teams alongside of the house and take out the plants. We have a main walk in the centre and a narrow foot-path leading from it, and we gather our plants in a low wagon and take them out in that way. If the house is 100 feet wide, you are never more than 50 feet from the centre. Where it used to take five men and a team to get plants out in the ordinary way, one man and a team can now keep a gang busy in the field.

Benches.—If tomatoes are grown with the intention of maturing the crop in the house, we have to start our seed about the first of January, and as the days are unusually dark, it is hard to start the seed on flat or ground benches. Therefore, it is a good idea, in building a house, to have a few

raised benches in order to get bottom heat. You can always manage to get good plants by using bottom heat to get them started. After they are started you can use the ordinary flat benches. If you have a little border of cement run around them, it is so much the better, but you can get along without it if you wish.

The matter of heating, I suppose, is the greatest item of expense. Vegetables growers have been put to a great deal of expense through the ordinary plumber of the local towns undertaking to lay pipes in the green-houses. I have found for my own part, that it is very foolish to give a man a contract to put in the pipes in a green-house unless you are sure that he knows what he is doing, or unless you know yourself how to manage it. The first time I had pipes put in, they were almost entirely useless, and I had to take them out again. I then learned how to lay pipes myself. When a person is experienced, and knows what he is doing, it is all right to go on with it, because any ordinary plumber can arrange the pipes if you show him how to do it. But the ordinary plumber doesn't know anything about heating a green-house, and therefore, it is best to give it to some person who thoroughly understands it.

Mr. Delworth: What material do you use for gutters?

A.—Chestnut scantling, 2×5. We support them by gas pipes, and where the rafters strike this 2×5, there is a bolt that lies over the scantling.. We take a brace and bit and bore holes near the edge of the scantling, and then cut out with a chisel two little corners, and the bolts drop in there. There is no chance for the water to lodge, and the rafters strike against this piece, and the end is cut off square. The bolt goes through and catches the beam and there is no contact point, except the one small corner. The gutter is made of galvanized iron, the edge turned down about ½ an inch to make it stiff, and that fits into the notch in the rafter.

Mr. Delworth: Do you heat by steam or hot water?

A.—Steam, our snow-fall is very light.

Mr. Delworth: From my experience of heating from hot water, if I had a gutter like that, I would be very much troubled with snow, and I would prefer one large house 30 feet in width standing alone.

Mr. Fraser: These things work out according to the location in which one lives. We have found it to be to our advantage, when we build an extra house, to leave a space between that and the other house of a little more than is necessary, in order to have room to drive through with a team, and in this space we have a protected, warm place for hardening off plants.

There are some houses in our section heated with hot water, and they work very satisfactorily. Where the house is large it is not practical to heat it with hot water, because it won't circulate, but some of the large American growers are using hot water in the ordinary return flue boiler, and then pumping the water through the pipes. Of course, that is only practical where it is a large plant. They claim that where they have a large plant it is very satisfactory. The water has got to go, and every portion of the house is heated perfectly.

We first began with very low houses, but we found that there was not sufficient air in them. I would rather have a house middling high, except in the case where it was intended to grow plants only for setting out in the field, as we did when we first started. We found that we could build a very cheap house by taking posts and setting them in the ground about 10 feet apart, 18 inches high, and spiking planks on the inside, and then running

up a ridge with about one-third pitch, and then digging out a trench in the centre of it; using the earth to bank it around the outside. The sash was made for 16x16 glass, and we have two sashes joined together by hinges so that they could be folded up and put away. Sometimes we had four inches deep of earth, and sometimes 7x7 of earth to each plant. Of course, these plants were heavy to handle. We found a convenient way to handle them by simply opening the sash on the outside and driving along with a team. These houses were easy to ventilate; that is only practical for a cheap house.

Q.—Which would you think was the most economical for vegetable growing, a house 40 ft., or two houses 20 ft. wide, open underneath?

A.—If I was not going to have a house more than 40 ft. wide, I think I would just make one house. It would be wide up to 35 ft. anyway for one house.

Q.—You think that would be preferable to two small ones?

A.—Yes, except where two houses might come in handy if you wanted to use one at a higher temperature.

Q.—I mean to have them connected?

A.—I think I would prefer the one house.

Q.—Which would you take, a large one or a small one?

A.—The big one is the easiest to heat. When you get a large house heated it will not cool off so fast, but it takes longer to heat.

Mr. Delworth: You have a larger body of air in there?

Mr. Fraser: In our case, we get more benefit from the sun. It shines in the sides of the house, and heats it up 10 degrees higher than it will the other one at the same time of the day.

Discussion.

Robert W. King: When I was invited to follow Mr. Fraser, and lead in the discussion, I hardly knew what I was up against. I asked if I could see a copy of Mr. Fraser's paper, but I could not do so. I shall touch only on the engineering features of green-house construction. I visited a green-house of a vegetable grower near Montreal, and I think probably he is the largest grower in Canada. I tried to persuade him to come out to this meeting, but he could not get away. He is going to put up a large number of vegetable houses next season, and before doing so he intends to travel the United States in order to get full information on the subject. Not being able to get him to come, I have to fill the bill as best I can.

I am in sympathy with Mr. Fraser as to the importance of the vegetable industry, but not just a side line to offset the peach crop. The growing of vegetables is going to be more important; the cities have to be supplied with vegetables, and we are getting a good many vegetarians, and they want the best, and the hotels are paying particular attention to supplying their guests at all seasons of the year. Therefore, I think the matter of growing vegetables is going to exceed in importance the matter of growing cut bloom, which is purely a luxury.

Mr. Fraser gave me an invitation some years ago to go out and see his place, and I was very much edified, and we had a talk which was to our mutual advantage. I am quite in sympathy with a man who starts out to try to find something new. If we simply confine ourselves to what has been done before; to what our fathers and grandfathers did before, to be sure of what we had we would be pretty safe, but in the course of time we would

get left behind. It is the man who starts out and tries something new, even though he does not succeed, who helps us. We will learn something from his failures as no man succeeds every time. You cannot depend on individual effort. There is a difference in locality and circumstances and so on; one has got to get an average, and thus we are bringing together men who have devoted time to the subject, and who have experimented and can be a benefit to one another.

Where a new object is undertaken, if a man has not the necessary information, it is he who should see to it that those whom he employs are competent. If you want to put in steam heat, don't go to a novice; go to someone who understands steam heating if you want to insure success. It is well enough to get up a design, and you may think you have the thing first-rate, but it is a matter of time and experience to find whether or not it is going to work.

We have had a considerable discussion on ridge and furrow houses. The ridge and furrow house is a serious problem in locations like Ottawa or Montreal or in Edmonton and Saskatchewan, on account of the snow getting on the roof. It is only of late years that it has been thought practicable to put up ridge and furrow houses in the neighborhood of Montreal. It has been rendered practicable by the adoption of iron gutters. The snow won't lie on the iron gutter, but will melt away, and by placing a hot pipe each side of the gutter, you can bring that snow down very fast. If a man is near a city where land is valuable, he cannot afford to put up separate houses on account of the high price of the land.

This party, to whom I referred, has a new range of connected houses, and in spite of the fact that they have stood two seasons, he is nervous because when they have a larger snow-fall, he is afraid his houses will not stand, and he has props ready in case of the failure of the roof. His present idea is to build separate span and he wants a 40 to 50 ft. wide house. He has 60 acres of ground, and cultivates the ground between the houses. So he uses more land than the glass covers. He has 100,000 square feet of glass. He grows 500,000 heads of lettuce and gets about four crops a year. He has about 75,000 roots of rhubarb. These new houses were put up for the purpose of growing carnations, but he now grows lettuce in them, and he finds with the lettuce it does much better in this house than when they had it in the old. His old houses were 50 feet wide, and the glass started one or two feet from the ground, and there was a great deal of timber in the roof. He found that the lighter the houses were constructed, the better the stock he grew. He is so much impressed with the improvement in the higher houses, that he is going to use them. One fault he found was that when the lettuce was close to the glass the leaves turned brown on the edges, but in the centre of the house, where the glass was high and away above the leaves, they were better and there were none of these brown tints. In the summer the beds close to the glass turned with the heat, and in the winter they get cold from the glass. He decided to raise the houses and the new range he is building will be kept up high. He has not yet determined on the width of the houses, but he thinks that he will have them 50 feet single span.

There was something said about hot water and steam heating. Hot water was employed all through this plant, but the new carnation house he put up has a steam plant and a separate power house. He has now made up his mind to have all his buildings heated by steam. He must have some very strong reason for that because he has a first-class hot water plant. He tried experiments with movable sash houses, and he says it never paid him to do it.

The big point in connection with green-house work is labor, and with the idea of building large houses comes the idea of cultivating the inside of the house with horse power. In North Wales there is a green-house that covers two acres of ground, and I see no reason why it could not be cultivated the same as two acres of field. It is simply necessary to have the door made large enough to drive the team in. A good many growers are now doing this and cultivating just the same as they would in the field. There is only one thing in the road and that is the heating pipes. This man in Wales, puts his heating pipes in the roof over head, and on the side walls. I do not think that it would do to have these pipes too near the top. Suppose they went about seven feet from the ground, then your ground would be clear, and in a large house your heat would be practically on the lower strata.

MR. DELWORTH: Supposing that you had a house 30 feet wide with the ordinary pitch and the plates about five feet high. If you wanted to heat that house with hot water, would it be correct to carry your pipes along the centre and return on the sides?

A.—Yes, that is done successfully. I think five feet is too low. I do not think any plate should be less than seven. Mr. J. H. Dunlop, of Toronto, had better results when he put them eight feet high. The tendency is to have the houses higher and larger.

MR. A. MCMEANS, Guelph: W. W. Rawson, of Massachusetts, has a house fifty feet wide and four hundred feet long. He puts in a team and ploughs the land. He has a $\frac{3}{4}$ span to the south, 6 feet high at the south side, and 9 feet at the north. Mr. Rawson claims that for a house 100 feet long it should be not less than 20 feet wide, and for a 200 feet house, 30 feet wide, and for a 300 feet house, 40 feet wide.

MR. KING: I do not think that applies; you can have them as long as you like. The theory is to have them high enough. If you have two feet of glass in the roof put one pipe below the two feet of glass. If you put all the pipes on the walls, the result is that the heat runs up that wall, and runs along the roof perhaps, as far as the first purline, and then it falls, and this cold current of air falls on your plants and runs over the plants to the side coils and then goes up to the roof again heating the roof. The first thing to do is to stop that cold air, and to do that, some people put a pipe along the centre and cut that air in two. The result is, instead of having one current of cold air, you have two of them, and it comes down to this, that when you are arranging to heat your house, you want to divide the heating surface exactly in proportion to your glass throughout the whole of the house, as nearly as the width of the beds will allow. If you can heat overhead and string all the pipes from the roof, all the trouble is done away with, because you can keep them an even distance apart all the way along. I think that is the proper theory.

MR. DELWORTH: Do you think that you should hang all the hot pipes from the roof?

MR. KING: You put enough on the outside to carry the outside wall itself, and perhaps two or three feet of the roof.

MR. DELWORTH: Don't you think that you would have all your heat at the top?

MR. KING: No, it cannot rise unless its place is supplied by something else. You can heat a bath of water and you will find that the hot stream of water will keep entirely separate for the cold stream. If you heat

a mass of air evenly it does not rise; the house will be ten or twenty degrees cooler at the roof than on the ground, heated in that way. I placed twenty-four thermometers in position and found that the house was evenly heated. I found that unless I put the thermometers exactly level, I would not get a correct reading. Unless there is something to set up a circulation of air, the theory of heat rising does not apply. If you want to heat a room with a furnace, you must have some place for the heat to come in and another place for the cold air to go out.

A Member: In that way, should a man see that the air coming in passes over the steam pipes?

Mr. King: That is a good idea. In the higher house the roof is so high that the cold radiation keeps away from the plants, and there is no question that you get a more even temperature in a large house. It has been found that the larger houses will take less heat, and you can heat a larger body with less fuel if the heating pipes are dispersed properly. The first large house I had any experience with was put up for Mr. Palmer, of Buffalo. It was 44 feet wide with 7 or 8 foot walls, and Mr. Palmer's foreman said that it took less to heat the large house than the smaller house. And I said, "Your smaller house has a proportionately larger surface of glass," we measured the pipes, and counted the panes of glass and found the proportion was the same. I said, "You simply have the same effect that we got when we departed from separate houses and put them in block, doing away with the side walls;" and I left him with that. When I went back a year afterwards, he happened to say again that it took a great deal less fuel to heat this large house, and I said "I thought we thrashed that out a year ago." He said, "So we did. Counting the pipes in this old house and in the new one. But," said he, "we have pipes in this big house that we have never turned on." I said, "If that is the case, I will have to make a new theory," and the new theory is that the pipes are on the ground and the side of his benches. If you want to get warm you go near your radiator. If you want to get cold, you will go near the cold radiator, and when you put the glass up high you take the cold away, and that is the reason why it is easier to heat a large house. I think that you will find it cooler over the top of the house than in the centre, and by keeping your bloom and your plants in this lower strata, you will get more benefit from the heat. When Mr. Dunlop built a larger house, he found that he got the best crop of American Beauty Roses that he ever grew.

Q.—Do you think that will work the same way if we have the pipes 7 feet in the air?

A.—The radiation from these steam pipes will throw down, and will form a warm blanket here through which the cold air cannot penetrate. I do not say but that it might take a little more fuel, but then, there is this point to consider,—that there is no more natural heat than that which comes from above. No man can determine these things. We have to take time to experiment. Ten or fifteen years ago I read articles on building a green-house by best authorities that would not apply to-day. Such green-houses are pulled down now and something else is put up, and what is built to-day may be pulled down ten or fifteen years from now. As to the span of the house, Mr. Dunlop persuaded us to carry one span 33 feet and to use light rafters. If we use a sufficient number of purlines, we can have a 33 foot span, and no posts to interfere when working the ground by horse-power. In the green-house I spoke about in Wales, the posts were only 25 feet apart, but in the

Dunlop house, they have them 33 feet apart, and are going to make 32 or 33 feet a standard construction.

I perfectly agree with Mr. Fraser that we must have sunlight. We can supply artificial heat and artificial manure, but we cannot make artificial sunlight; therefore we must build our houses with as little framing as possible. As one gentleman said, "There should not be one straw hanging up in a green-house that you can take away." I do not think that the shape of the roof makes any difference; I think that the roof should be kept as flat as possible.

Q.—Do I understand that this house with the 33 foot span takes less heat to keep it going than one one-half the size?

A.—Yes, less heat for the square foot of bench.

Q.—Do I understand you to say that there was the same amount of piping, and, when you went back you found that one-half of the piping had not been used

A.—No, he said it took much less.

Durability. A gentleman said that if you built a house of wood it soon began to rot and get lousy. That is a fact. They get filled with woodlice, and I think that there are other things that breed in rotten wood. There are insects that will mature in the rotten wood, and come out on your plants to feed; particularly in vegetable houses. We approached a man who had wooden houses growing vegetables, and we wanted to put in iron construction, and we said it would last longer, and he said, "I don't want durable houses" and I said, "What was the reason," and he said, "No vegetable house should run more than four or five years, because after five years it gets so lousy that it should be burnt up."

Painting. I do not know anything about chestnut. I have heard that white pine is very good, but it is difficult to get, and is very expensive. Painting is important, and it is important to do it right. The first coat should be nearly all oil, and it should be raw oil, so that it will soak well into the wood and give it plenty of time to dry. The next coat should have raw oil and white lead, and should be put on thicker. You can put a little drier in the third coat if you like, and also a little blue to whiten it up. The main point is to preserve the wood, and to get the oil in the grain. It should be put in raw, and given plenty of time to soak in. If you put in drier you just keep the paint on the surface. It is important also, to keep the ends of your bars away from the wet, and the side depth of the bars should be as small as possible. We put in extra purline, and, by doing so, we can use a lighter bar and save half a cent a foot of bar on the price, and let in more sunlight for an extra hour in the morning and afternoon. On that account, Mr. Dunlop says that he will never use the heavier bar again, and that was one of the conditions he made, that we should get the house 33 feet span using the light bar. If you use 20 x 20 glass it may be necessary to give additional depth to the bars, but we found in measuring it out that you can get the same effect by using 16 x 16 with lighter bars. Mr. Dunlop used the 16 x 16 with the lighter bar.

Taking out the soil at the side of the house, only applies to a separate house. I think that the more practical way is to take it out at the ends. Those that have very long houses have a wagon set on tracks, and they run this between every two beds, and they have a track for the truck that is movable. I think that the time is coming when we will have openings large enough to drive horses in.

Mr. McMeans: In your experience with hot water, should the flow pipe rise to the farther end of the house? A.—The correct way is to raise it to the highest point, as near the boiler as possible, for the reason that the circulation is in the cooling of the water, and if you run to a distant point and run up hill to there, you are carrying the water against your circulation.

The rule for laying water with two-inch pipe is to give 6 feet of head to a 100 feet house: heat a house, put a two-inch water pipe in place of a one and one-quarter inch steam pipe. It will give the same effect, but you must have a certain circulation head on that two-inch pipe, or it will not give you the heat.

Peter Rienburg built a central water plant and put in forced circulation, but the theories are against forced circulation, because you cannot have power for nothing. You have to have the machinery running, and that costs money. When you have four-inch pipes you can do with very much less head. If you have steel gutters you will never have trouble with snow on your roof. In Quebec they say it is cheaper to let the snow stay on your roof and melt, than to carry it away. (Applause.)

GREENHOUSE MANAGEMENT.

By T. Delworth, Weston.

The question of properly heating a greenhouse depends a great deal on the size of the plant to be heated. We have been discussing two methods of heating, the hot water and the steam. There has been a great revolution in greenhouse construction during the past ten or fifteen years. We started out with the brick flue, then we got the coils, but now, there are only two systems worth considering, that is hot water and steam: Hot water for the small plant and steam for the larger. Steam requires too much attention for the small plant; but where a man is running a large plant and it will pay him to keep a night man in attendance, then I would say by all means put in steam, because you can burn cheaper fuel, and the saving in fuel will pay a man's wages. If you are running a plant under 10,000 feet of glass, and it will not pay you to keep a night man, then, I say, by all means put in hot water.

Ventilation is something that we have been overlooking. I think that we can get better results by thorough ventilation in the coldest days in winter, and when you come to April and May, it is still more necessary to have thorough ventilation.

A large house with a single span is much easier to ventilate than a row or block of houses with a ridge and furrow. To my mind, the house that approaches nearest to the ideal for vegetable growth, is one built about a year ago by Mr. F. Williams, of Ottawa South. Your president (Mr. Bushell), and I visited that house last spring. It is 175 feet long, 30 feet wide, running east and west, even span. They have a row of ventilators at the ridge. The plates are about six feet six inches. Along on the south wall there is a row of ventilators, and they open that row in the south wall and the row at the ridge, and that causes a current of air to come in that rises as soon as it gets in the house. Hot air is lighter than cold air, and it naturally will rise and disperse a certain amount of cold air, and the cold

air will sink and take the place of the hot air. The principle is exactly the same as the circulation of hot water in your pipes. The reason that water circulates in your pipes is that cold water is heavier in proportion to its bulk than hot water. You heat the water in your boiler, and that water rises and the cold water comes down to take its place simply because it is heavier. The hot air works exactly on the same principle: hot air rises because it is lighter than the cold. You do not want a cold draft to come in direct contact with your plants.

A MEMBER: Where are these ventilators?

MR. DELWORTH: Right under the plates and above the plants. The concrete wall is about two feet or two feet six inches, and the ventilators are above the top of the concrete wall, and above the plants.

Q.—There would be about three feet of glass? A.—Yes, two and a half to three feet.

Q.—Are the beds on a level with the ground? A.—On a level with the ground.

Q.—On a level with the concrete wall? A.—No, on a level with the ground; there are no benches in this house.

Q.—Would it not be better to have the heat under the plants? A.—No, I do not think it would; there is no advantage in putting the pipes under the benches for the sake of warming the soil under the plants. I think, taking the season through, and taking the months of December and January when we have little sunshine, you might get better results then by warming your soil. When you come to the months of February and March, when we have plenty of sunshine, then it is not of any advantage, and I have just as good results from the heat supplied from above. My experience has been nearly altogether with hot water. When I see something that I think is better than what I have myself, I will adopt it in a small way and test it.

Q. Do you think that all vegetables are the same as regards these raised benches? A.—I am speaking more as regards the leading crops such as lettuce. I have seen much better lettuce grown under solid benches than I have ever seen on raised benches.

Q.—What about tomatoes? A.—The most successful men growing tomatoes in greenhouses grow them in solid beds. I have never yet made a financial success of growing tomatoes on the raised benches. I have tried it, and I have always been able to make $1.50 on lettuce, where I have only been able to make $1 on tomatoes.

Q.—Can you grow as quickly on ground benches as you can on raised bench? A.—I think that in the month of May you will get a crop as quickly. In December and January I think that you will get a crop of lettuce quicker on raised benches, but I do not think that crop will turn out as many bunches as on the solid bench.

Q.—Would that be on account of not getting enough water in the raised benches? A.—I think perhaps it is.

Q.—Would you not think that a great deal of the success of the solid bench is because the quantity of water you have to pour on the raised benches washes the fertility away and kills the soil? A.—I think that there is a great deal in that, and then you have to water the greenhouse once or twice a day, and every time you do that, you are chilling the soil. With the solid benches you do not require to use so much water. I have experimented a

little that way myself, and I have come to the conclusion that the solid bench is the best.

Q.—Did you ever try growing radishes on the solid bench? A.—No, I have never tried it.

Q.—Then do not do it. A.—I have seen them grown on solid benches. One thing we should consider is, "What is the most profitable crop to grow?" I have never been able to grow radishes profitably. I think lettuce is the most profitable crop; the price of radish is not enough to warrant a man going into it to any extent.

Q.—How do raised benches compare with the solid bench in the matter of labor? A.—The way I have worked them, they are very much more expensive than the solid. In the first place, you have the expense of the bench, and the wood soon rots out and you have to renew them every few years. In growing cucumbers, I have had fair success with raised benches, in the middle of May; I have never tried them in mid-winter. We always let our cucumbers take the place of the last crop of lettuce. I think that in the past, we have not supplied sufficient ventilation. I have the fortune, or misfortune, to be a school trustee, and one day one of my constituents came to me with a great complaint. He said that the windows in the school were actually open when they had to have a fire in the school, and he thought that they were wasting fuel. It was useless to try to explain to that man that we had forty children crowded in a small room, and that they had to stay there so many hours, and that a change of air would be good for them. He thought that if we let the fire go out we would have ventilation enough. (Laughter.)

We have to give our plants fresh air in order to keep them healthy. Another thing is greenhouse accessories—that is, tool room, coal-bunkers, wagon sheds, and so forth.

It is almost impossible to get men to assist in greenhouse work who are of any use. We have had them, but by the time we get them good and right, they start up for themselves, and we have to break in a new man. Therefore, we have to be able to lay out our work so as to do the greatest amount of work with the least possible amount of labor. I had my plants put up with that object in view, and had my coal bins constructed close to the boiler, and had wagon shed and water tank all completed. My wagons are loaded inside the shed; the boilers are in one corner and the coal bins behind them. Part of the roof is elevated, and the water tank stands up there. The bottom of the tank is nine feet above the floor of the shed. The floor is made of cement, and I back my wagon in beside the boilers, and we have room to pack the lettuce beside the wagon.

We use a lot of water, and would advise having a good head of water, because you can get over the house in one half the time you can when you are troubled with a slow flow of water. For every two feet you elevate the tank, you get an extra pound of pressure on the hose, therefore I would advise getting the tank as high as possible. I know some men who have to take their coal in to the boiler in a wheel-barrow. I used to have to carry the cases of lettuce out of the greenhouse and put them on the wagon, and while the wind was blowing the cover off one package I was carrying out the other; now, I can deliver a load of lettuce in Toronto, in freezing weather, and none of it will be frozen, because everything is warmed before we start. I put an inch or two of straw or hay at the bottom of the boxes and that is warmed, and when we put the cover on everything is warmed through, and it takes some time for the cold to get in.

As to soil, my experience has been that sandy loam, with a liberal mixture of horse manure, is the best. I like a soil that will dry off on the surface after watering, and still retain the moisture. In order to do this, you must have a soil that will lay open, and you must have plenty of humus in it. In some soils a mixture of 10 per cent. of sharp sand gives very good results. Under no conditions must you have a soil that will run together and pack with water. You want a soil that will stand lots of water.

Insects. I have never yet been beaten with the green fly as long as I had a plentiful supply of tobacco. I have had bad cases, and have seen some growers who had to throw the crop out. There are two or three ways of using tobacco. First, using an efficient method of fumigation. I always use stems from cigar factories. I have never tried stems made from plug tobacco. I am told that it does not give as good results, and am willing to accept that as long as I can get good results from the others. I always dampen the stems before burning them. I never burn dry stems as what you want is a heavy fume.

Q.—How long before do you damp them? A.—Not very long, I think an hour before.

Q.—How would you damp them? A.—Simply lay them on the ground and get a watering can and water them and turn them over.

Q.—Do you find fumigation with tobacco stems burns the leaves? A.—No.

Mr. Bushell: I killed a crop one time by burning the wet stems. That must have been plug tobacco.

Mr. Delworth: Another way I use tobacco is to get dry dust and scatter it on the ground between the plants. I find this to be just as effective in cleaning off the aphis as the fumes.

Q.—How about tobacco ash? A.—I have tried ashes also; that will burn lettuce. I find that injures the lettuce. We do not like our customers to say to us, "You have used tobacco on this lettuce."

Q.—Have you been bothered with a little white fly, more like the shape of a moth? A.—No, but I have seen it. I have never had it in the house. I understand it is a very hard thing to fight; I may say that about a year ago, I was in a greenhouse and I saw some. The man told me that he had a very easy remedy for killing it, that he used a lotion of coal oil and washing soda.

Q.—Sprinkle it on? A.—Yes, he sprinkled it on. I cannot remember the proportions now; I cannot tell whether it is any good or not, because I have not had the fly.

Mr. Jos. Rush, Humber Bay: What is it like? A.—It is something in the form of a thrip, it gets on the leaves and attacks the tomatoes; they had a few up at Guelph.

Mr. Rush: Is it something like the green fly?

A.—It is very much like a mature insect; I have never had one in my greenhouse. At Guelph, three years ago, they had so many they were unable to combat them.

Q.—In selling lettuce in Toronto, you have to consider the market. Here in Toronto it is always sold by the bunch.

Mr. E. E. Adams, Leamington: How much does a bunch weigh?

A.—I will try and explain that. When I was down in Ottawa talking to Mr. Williams, he took me into his greenhouse where he was growing Grand Rapids lettuce. He said, "How would you put that on the market?" I started to work and got a head and cut it up and tied it. "What are you doing?" he said, and I said, "Well, that is large enough to make two bunches, pretty near three, and I am making two bunches out of it; this is the way we sell it;" and he said, "We cannot do that way; we cannot break the heads."

The PRESIDENT: If we educate the people all over the country up to our ideas, do you think that there would be any more money in it for us? Can you raise cabbage lettuce in a hot-house?

A.—Yes, on the solid bench, but not very well on a raised bench. I plant them four or five inches apart, that is fairly close together, and they are not long sown before the earth is covered, and when they get seven or eight inches high, they are ready to cut. If your crop has done well, your heads will average a bunch each. We cut that crop ten days to two weeks sooner than we cut a crop of heads that are planted six or seven inches apart, and we cut an extra crop in the season. Where you will cut three crops, we will cut four.

Q.—You have that many more plants to care for?

A.—Yes, that many more to handle; we grow in boxes and transplant from seed boxes and then into beds, transplanting twice. I think possibly that I will still retain some raised benches; whether I do or not, is a question. I think that it will pay a man to build a place expressly for forcing rhubarb. It would not be a very expensive building. As long as I can get a sale for a profitable crop of lettuce, I will grow it. I think that we all ought to adopt the rule of growing a crop that is profitable; if the public will not pay the price, cut it out. If I have a crop that I am only making $5 on, and another alongside of it on which I am making $10, I am going to quit growing the $5 crop.

The CHAIRMAN: Did you ever try raising cauliflower in a hot-house?

A.—I have never tried it. I do not think that it would be a profitable crop, because we get our cauliflowers shipped in from California.

A MEMBER: What about the length of time required to grow this small lettuce?

The CHAIRMAN: We sow the seed in flats. We used finnan haddie boxes that we got from our grocers at 25c. a dozen. We keep them there until the second leaf is nicely developed, and then we transplant them into other boxes about one and a half inches apart all over the boxes.

A MEMBER: Where do you keep all these boxes?

A.—I am glad you brought up that point. Some day we will have to cut it out. I have shelves in one of my houses; the purline posts stand up alongside of the path. We have the shelf which is fastened up by half-inch iron hooks put up on wire. The shelf runs the whole length of the path, and on that we put a little over 100 boxes. They are not over the benches, and we are not troubled with drippings from them; but they cause a certain amount of shade and for that reason they are objectionable.

Mr. WHITEHALL: Do you find that they will grow as near the glass as that?

A.—Yes.

Q.—According to the discussion this morning, we thought that the farther the lettuce was away from the glass the better.

A.—We want to make every inch of space tell.

Q.—Don't they get a lot of cold vapor up there?

A.—I have never found any more trouble from the dampness up there than from the benches. I have had more trouble this year from the brown rot than I ever had before.

Mr. Rush: What kind of soil do you put in these boxes?

A.—The same as I put in the benches. I found sharp sand to be good. We use the same soil for sowing seed and transplanting. Mr. Legarie, of Montreal, uses his benches for raising the seed. Now that we have got the plant we put them in these boxes and let them stay there and mature two weeks until they are three or four inches high—three inches is high enough. Then we turn our soil over and get it nice and mellow, and take a stick and mark it out; then I take a boy and get down these boxes. First, we water them twenty-four hours before we are going to transplant,—give them a good soaking of water,—and then we take out the plants with a little ball of earth. If you set the plants out dry, the chances are that they will wilt right away.

Mr. Rush: Then in five weeks you plant them?

A.—From the seed. The length of time before they are ready depends upon the temperature of the house. A great many lettuce growers advocate a temperature of 45 to 50 degrees. I want it from 50 to 55. My experience is that there is mighty little doing in a house where there is a temperature of 45. The plants are living, but not moving. You are more liable to insects and mildew with a higher temperature; if you have plenty of ventilation you avoid this. I get five crops of lettuce a year. I had one house that averaged 7 degrees lower in temperature, and only got four crops off it in the winter.

Mr. Rush: By winter, you mean December to May?

A.—We get the first crop in December, and the last crop in June; we cannot cut out-door lettuce until about the middle of June.

Q.—About how many of these lettuce heads go to the pound?

A.—I cannot say, I never sell by weight, always by the dozen, and I have found, in a good crop of lettuce, on an average, a dozen bunches to two square feet of bench. I think that in the past, we have not paid enough attention to the details so as to get at the cost of our crop. We sell at market prices, we have got to do that. But that does not prove that it pays to sell at market prices, and I think that we should take our greenhouse beds, and figure out that we have so many square feet of bench, and so much lettuce or so much radish and so on. If we would do that, we would know the crop that was the most profitable.

Mr. Adams: That makes twelve weeks altogether to grow the lettuce?

A.—Yes, in a house where you keep the temperature up to 50 to 55 at night, I think that it would be all right to cut in five weeks after transplanting. Of course, if you have plenty of sun, you can cut it a day or so earlier.

Mr. Fraser: With that temperature, would they not grow thin and not so crisp?

A.—Where they are grown at 45, the lettuce would be thick and tough, but I do not think the quality would be very good. If you are going to grow a large head of lettuce, I do not think that you could make a success of it at

a temperature of 45; if you want a large head of lettuce to sell by the pound keep a low temperature, but if you are going to sell by the bunch, it is better to keep the temperature up to 55, or even higher.

Mr. Rush: Would it pay an ordinary grower to do that?

A.—I have not as many pipes as I should have, and I am going to put in more this year. I think that we should have abundant means of heating, it is false economy to cut out some pipes, and have one crop less in your greenhouse. Then again, it requires more attention to the fire. If you have a greater amount of pipe, you do not require to push your fire so hard. When I build again I am going to provide a foot of radiation surface on the pipes for every three and one-half square feet of glass in the roof and ends.

Where you do not keep a night man, the cheapest fuel is the best hard coal you can buy. I have tried soft coal, slack, and coke, and I do not know how many other kinds of fuel, and I believe that hard coal is the cheapest I know of in the long run; I find that it gives me the best satisfaction. I can make up a fire, and it is reliable, and I can go away and leave it, but when you are burning soft coal, you have to go back every few hours.

Q.—Have you ever tried gas for the purpose of doing away with the green fly?

Mr. McMeans: I use eleven ounces of potash, eight ounces of sulphuric acid and three ounces of water.

Q.—That is rather a dangerous proportion?

A.—Yes.

The Discussion.

Mr. A. McMeans, O.A.C., Guelph: My preference is for the solid ground bed. Before you plant your crop put on a good coat of manure and soak your soil well the day before planting. You can then plant. You will not want any more water on your soil until your plants cover the ground, and then you can turn the water on gently and wet the soil thoroughly between the leaves. Do not wet the centre of the bed if possible.

Q.—Why?

A.—Because you will do away with that brown rot by giving your soil a good soaking. It will not need any more water till the crop is fit to cut. That is practically only two waterings, and then, if you are going to cut the lettuce to-morrow morning, water this afternoon the portion that you are going to cut to-morrow.

Q.—How far apart do you have your rows?

A.—I had seen them 5x5, 5x6, 6x6, 6x7, and I concluded that six inches is about right.

Q.—Is that the Grand Rapids variety?

A.—Yes.

Q.—Were you going to sell by the pound or by the bunch?

A.—By the bunch; I was not satisfied with the lettuce they were bringing on our market, and I went to one of the local dealers in town and I told him that I was going into lettuce, and I said, "I am going to put on a better article than you are getting, and I want to have a better price." I went to him with my crop and left him some, and it sold very slowly, but the people who bought it came back and wanted more, and I got my reputation right

there, and then they wanted the big lettuce every time, and before I got out, they were taking my whole output.

If any one wants to go into greenhouse business I would advise them by all means to visit Thurl Brothers, Toledo, Ohio. They have a greenhouse 14 feet wide by 750 feet long; they have ten of them and are adding five more this year. The first thing I thought peculiar about this house was a cement walk 4 ft. wide the full length of the house, and then another cement walk 3 ft. wide up one end, and then another one three-fourths of the way down, and they truck their stuff down these walks. He barrels up his lettuce and ships it in that way; he sells everything wholesale. He does not sell a bunch retail or even wholesale in his own market; it is all sold by the bunch and the price ranges from ten to sixteen cents a pound. He has a water system of irrigation called the Skinner system. It is right under the gutter; it has an iron pipe with spray nozzle every three feet, and he can direct it to any part of his beds. The water is strained before it comes into the pipe so that it will not block the nozzle, and when he is through watering he turns off the water and rushes back and cleans the strainer. This system puts the water on in such a fine spray that it will not bake the soil, and the soil is always left loose and porous.

Q.—Has he any rot?

A.—Yes, he has more or less.

Q.—Does he water it the day before he cuts it?

A.—He has done away with that. I would think it would be a great advantage to a man selling by weight. By soaking his barrels in a tank after they are packed they take up sufficient water. You will find the aphis punk a simple thing for the fly. Put it on a piece of wire and light it, and the fumes will almost choke you. The principle is the same as with tobacco, but it is a nicer way to do it. If it does not clean out the fly with the first application, do it the next day, and you will probably get rid of every one of them.

Q.—Is there any danger of hurting the lettuce?

A.—No danger; no matter how much you use. You can use it twice as strong as the directions on the box. We had trouble with the white fly last year at Guelph. We had a crop of tomatoes, and if there is anything the white fly likes it is the tomatoes and cucumbers. It is a very small white insect and it can fly around quite lively. We read all we could find on hydrocyanic gas: two ozs. sulphuric acid and four ozs. of water to each thousand feet capacity of your greenhouse. We put this in for twenty minutes, and then we opened the house, and we let in the fresh air, and we thought we had perfect results, and we had for about three hours, and then the flies started to come to life and the plants started to die. We killed every plant. We had some plants growing in another house that were covered with the white fly, and we got a small case made about three or four feet square, and we experimented by putting one on every plant, and using a very small dose, and we came to the conclusion that we could use about one-fifth of that dose to each 1,000 cubic feet, one-fifth oz. potassium sulphite, two-fifths sulphuric acid, and four-fifths of water.

We started another crop of tomatoes and we had the white fly thick and heavy, and we used that preparation and cleaned out every one of them and no harm resulted to our tomatoes. We got our result by using about one-fifth what everybody else recommended, and instead of giving twenty minutes exposure, we put it in at night and left it until morning, and we could go in the house the next morning without danger. You could not use this hydrocyanic acid gas at a temperature less than 60 degrees, and even

moonlight will affect the plants; direct sunlight will kill them. You must take a dark night and leave it in all night; use a small dose, and you will be able to get rid of the white fly without any trouble. One of the students wanted a white fly for a sample, and he went through the house and had hard work to get a sample. Last year, when we put up a dose, it was like a snow storm at the greenhouse there were so many white flies. They were actually eating the plants up. The white fly is infesting California, and they are fighting it off for their lives.

Q.—Did you just leave the preparation in the greenhouse?

A.—Yes, you have to use an earthen vessel, nothing metal or wood. There will be a little residue left, and this is poison to a certain extent. You can throw it in the manure pile, it is fertilizer.

As regards the size of the bunches of lettuce, I think that it is only a matter of education on the part of the growers in each district. They can easily educate the people to take the proper article. The growers around Toronto used to put up green onions, two or three in a bunch. Times got pressing and wages got high, and they got away from that, and I think that they can do the same with regard to lettuce. They used to have small bunches in the city where I came from, but I started in with a large lettuce, and I got the price.

Q.—What would you call a good price for big lettuce?

A.—I used to get 80c. a dozen for Grand Rapids in the winter, and right along till the summer lettuce came in. I planted my lettuce 6 and 7 inches apart.

Q.—How many crops did you get?

A.—Three, and one crop of radishes.

Q.—When would you bring in that crop of radishes?

A.—Just before the out-door radishes came in. I sold them for 50c. a dozen; I have sold them as late as the 15th of May. I think that if the lettuce is grown at a high temperature you do not get the texture.

Mr. Rush: We have to cater to the working class in Toronto; they require lettuce in the spring, and they can only buy 5c. worth.

Mr. McMeans: You go to Brantford to-day, and the grocers tie it together and make a 10c. bunch.

Q.—Last year you tried sub-irrigation on some of your benches, and I would like to know the result?

A.—I would prefer not to answer. We did not get the result we looked for: we are going to carry it on again this year. By using sub-irrigation for tomatoes, you will get your crop bearing a week earlier, and they will finish two weeks earlier.

Mr. F. F. Reeves, Humber Bay: Would you think that there would be any difference in the cost of sub-irrigation and tap watering?

A.—The cost of tap watering is a minimum in sub-irrigation after you have installed the plant. We find three or four days difference in radishes. You will find 20% in favor of sub-irrigation.

Q.—Would sub-irrigation make any difference in the length of time that the crop takes to grow?

A.—I could not see any difference last year. I brought radishes along earlier. You can buy a thermostat and install it for $5.00, and it will ring a bell in your house and warn you when the temperature falls. If any of you gentlemen wish to buy one, I can furnish you with the address of the sellers at any time.

Mr. Rush: Which is the most profitable, this quick growing lettuce that will be ready for the market in six weeks at 25c. a dozen, or the Grand Rapids?

Mr. McMeans: It will depend upon the time of the year that it is grown. You will get a crop in the spring quicker than you will in the month of December or January. I prefer large lettuce.

A Member: Would you use any heat for the last crop of lettuce?

A.—I always believe in carrying the heat right on, I do not believe in checking anything. In fact, I prefer to carry the heat and keep your ventilators open. Peelman Bros., of Montana, Ill., have two plants, and they have two men that do nothing all winter but look after the ventilators and heating; they walk through the house and look after the ventilation, and it is very seldom, when you will go to their plant, that the ventilators are not open. They have a certain amount of fresh air coming in all the time.

Q.—Does it hurt the lettuce to freeze it while it is growing?

A.—I have had it freeze. As long as the sun does not get at it; if it has been growing at a pretty high temperature and then gets caught with the frost, it will hurt it.

Q.—What about sterilizing the soil?

A.—They do that at Boston; we have not tried it. They are affected with the root rot, and they sterilize their soil with steam at 212°; they bake it until every part of the soil is up to 212°, and their crop comes along the faster for it. They have what they call the Sargent apparatus for sterilizing. They have discarded that now, and they run a pipe the length of their bed, and then throw a blanket over it and bake it to 212°, and then let it cool and use it.

Q.—Do they leave the pipe buried?

A.—No, they take it out and use it in another bed. Rawson used electric light for forcing, but he gave it up, and in one of his houses he put in copper electroids at one end, and zinc at the other, and connected it with a wire from one end to the other. It is good. He got good results from it. We are going to try it in Guelph.

Q.—Have you ever tried hot steam pipes in the soil?

A.—No, we heat with hot water, and we haven't any place that we can do that; but at St. Anne's, Quebec, they are heating their hot beds with steam pipes run through the soil.

Mr. Delworth: I have used them in forcing rhubarb. You will get quicker growth, but it affects the color. You set the root right at the hot water pipe.

MELON CULTURE.

By T. J. Gorman, Outremount, Que.

We prefer a light soil, and we also prefer high-ground so as to prevent any water from getting underneath. Our hot-beds are 6 x 12; 3 sashes. The seed is sown in a hot-bed in the beginning of April, in drills six inches apart, and when the third leaf begins to show, the young plants are ready for potting. We use five inch pots, two plants to a pot, and place or plunge them in another bed which has been made for this purpose. Care should be taken to shade them for two or three days to prevent wilting.

We now turn our attention to the place where they are are to be set out or grown. To this we give a liberal dressing of well-rotted manure and plow in, after which we dig the trenches; these trenches are made in rows twelve to fifteen feet apart, and 18 to 20 inches deep, the same in width. When the time comes for planting out, say the first week in May, we fill these trenches with well heated horse manure, pack firmly and level off to the surface of the soil. We then put on the beds two or three feet apart in the rows, being careful to have the manure in the centre of each bed lengthwise. Next day, we fill in the earth, this we take from both sides of the frame, and throw it in the centre of each right over the manure. If this work is done in the morning they are ready for planting that afternoon. We always plant in the afternoon, about four o'clock.

Before planting, we water the plants thoroughly, and pinch out the top or centre of each plant; this is the first stopping they receive. In planting, remove the pot carefully, place the plants in the centre of each light, leaving two or three inches of earth over the manure; pack the soil well around the plants and water. I may state here, that this is the only hard watering we give them. As they require it during the season we pull back the sashes for favorable showers, being careful to replace them the same evening.

Airing is also very important; this is done about eight o'clock every morning, closing down around five in the afternoon, so as to retain sufficient heat to do them over night.

When the plants begin to run, that is when the vines are from a foot and a half or two feet long, they require earthing. To do this we take off the sashes, remove any weeds that may have started, turn the vines over to one side, and throw in sufficient earth to level off the beds; repeat the same operation on the other side and train out the vines, pinching out the centre or top of each vine. This is the second stopping.

By this time, the space between the beds requires attention. This we dig or plough and level in such a manner as to have a fall to the centre between the frames. As the beds begin to fill with vines, they require to be let out. We take off the sashes, raise the frame about a foot, and train out the vines carefully, again pinching back the tops. This is the last stopping they receive. Place four blocks or flat stones, one at each corner, to receive the frame; this leaves a space of three or four inches, and prevents the vines from being crushed; replace the sashes, and air as usual.

By this time, most of the melons have set, and as they begin to swell and net, they should be turned, not completely around, but just enough to relieve the part that rests on the earth, and in such a manner as not to bring the exposed part in direct contact with the sun. This process of turning is very important, and should be done at least, once a week throughout the season. About a week or less, as near as we can judge, before the fruit begins to ripen, we remove the sashes and frames, store them away, and train out any vines that may require it.

In marketing the melons, we are careful not to have any of them over ripe; to prevent this, we go over the patch every morning, and, should it be a very warm day, we place them in the storehouse in the evening and ship or dispose of them every day.

Mr. Rush: Is this hot-bed spent or a fresh made bed?

A.—Fresh made bed. Care must be taken that the plants do not wilt.

Mr. Rush: Your sashes go lengthwise to the channel?

A.—There are two sashes to the bed; the sash would go lengthwise to the bed.

Q.—Are these sashes level or on the slant?

A.—A little on the slant.

Q.—Facing the sun?

A.—Not necessarily.

Q.—Do I understand you to say you pinch out the centre of each plant?

A.—The top end of the vine.

Q.—How many hills in a frame 6 x 12?

A.—Three.

Q.—Have you any idea what these frames would average?

A.—We calculate a dozen melons to each frame to be a good crop. For the last seven years we have had a contract for these melons at $10 a dozen.

Q.—How many of these melons sold in Canada at that price?

A.—The lowest price realized on the Bonaventure Market last summer was $8.

Q.—What would they average in weight?

A.—A dozen melons will average about 100 pounds. What we aim at is a good thick melon with good thick flesh, and if you get a melon that weighs below 8 or 10 pounds it is likely to be thin.

Q.—What variety do you use?

A.—The Gorman Melon.

Mr. Delworth: Would I be correct in calling it the "Improved Montreal Nutmeg?"

A.—It is the Gorman melon; my father was the originator of it. It is not a nutmeg at all. It originated from a melon known at that time by the name of Menaka and the Nutmeg. The Menaka was a large melon, but it had not much flavor, and the Nutmeg was a small melon and very sweet. I have been growing that seed for myself for the last 27 years.

Q.—What is the color of the flesh of the melon?

A.—Light green.

Q.—You preserve your own seed right along?

A.—Yes.

Q.—Is there something peculiar on the Island of Montreal that develops them there?

A.—Culture and attention.

Q.—How much land do you cultivate in this way?

A.—About three acres. We have about 300 frames.

Q.—Where do you get the fresh manure?

A.—It is practically unlimited in the city.

Q.—When do you sow them in the beds?

A.—The first of April. We sow them in the hot-bed in ordinary soil.

Q.—Do you remove this manure from these trenches again?

A.—No, we do not, we leave it there. We change the place every second year, and we make a point not to dig the trenches in the same place; if we do come across an old trench we find it is practically gone dry and the soil cannot derive any benefit from it. It is useless.

Q.—How much soil do you have over the manure in the hot-bed?

A.—Two or three inches; we generally measure it with our fingers.

Q.—Why do you wait till the next day after you put the manure in before you cover it?

A.—So as to give the manure an opportunity to heat. This year we could not start until the third week in May. That class of goods was practically a failure on the Island of Montreal this year. We make about three sowings, and we start to cut about the 25th day of July, and continue until the middle of September.

Q.—Do I understand that you leave this glass on the frames until they begin to ripen?

A.—Yes, more especially of late years, since the weather has been so changeable.

Q.—Has any one a very large acreage?

A.—We do not go in by the acres so much as by the frames. One party down there has between 500 and 600 frames. His frames are 12 feet long by 6 feet wide, and are portable.

Q.—Do you cut your melons from the vines?

A.—Yes.

Q.—How do you know they are ripe?

A.—When they begin to detach themselves from the vines. As soon as we notice the vines crack we are very careful to cut them, because the melon would be unfit for shipping in three or four hours. The majority of melons are shipped out of Montreal. Some of them are shipped green, cutting them two or three days before they ripen. The early vines die after they have ripened their fruit, and from the others we can get a second crop and we ship the melons green.

Mr. Rush: Do you have any blight? A spot that comes under the leaf?

A.—No, we do not know anything about that. We have had stem rot, and to prevent that we take a little dust from the top of the soil, and we are never troubled after.

Mr. Rush: Do you grow any quantity of melons without the use of this glass?

A.—No, we could not grow them.

Q.—All under glass?

A.—All under glass. I have sold melons on the market in Montreal for $15 a dozen. My father had a good reputation for growing melons, and I started in some years after. At that time, the buyers were confined to possibly two or three, and if they did not buy from you, you could take your melons home—nobody else would buy them. These buyers commanded the trade of the principal hotels, and one of them said I would have to sell to him. When the melons would be plentiful, he would buy two or three melons from me, and fill up his order with melons that looked as well as mine, and send them all off under my name. I was three years making up my mind what to do, and finally decided to use a rubber stamp, and I put my name, "Gorman," on the smooth portion of the centre of the melon as a guarantee, and if that melon does not turn out satisfactory I am at a loss at the end of the year. We get two or three not satisfactory. (Applause.)

Discussion.

W. A. Emory, Aldershot: I do not think that it would be practical for us to grow melons in the same way that they do in Montreal. They have peculiar local conditions. However, it might be worth an experiment. There are two or three things we might learn. I believe that we lose a great deal in the culture of our melons, from not turning them, allowing them to lie on the same spot all through the season. There is another suggestion as to guaranteeing the melon. I think that if we undertook to guarantee all the melons we grew, we would get ourselves into a bad fix, because we grow lots of melons that we think are good enough for the city people to eat, but we would not want to eat them ourselves. I can assure you that nine-tenths of the melons that I ship I would not want to eat. It is a matter of

the taste being educated. There are a great many people in the cities who do not know a good melon from a poor one. They put on lots of sugar and salt to give them flavor, but a good melon doesn't want anything else to give it a good flavor.

Q.—What variety do you grow?

A.—Lately we have been growing a small melon; we used to grow nothing but the large melon. Three years ago, I started in growing Rocky Ford. Rocky Fords were not grown in our neighborhood at the time, but this year, every person has Rocky Fords, and they were not much more profitable than any other kind.

Q.—What kind of seeds do you use?

A.—There is just as much difference in the seeds you get from one place as day is from night.

Q.—Don't you like to rely on our Canadian houses for the seed?

A.—I think that it makes very little difference, because they all get their seed from the other side. There is no doubt that melons grown in the way Mr. Gorman grows them are very good melons, and I can understand that these melons going in to the Montreal market would bring a big price. I have taken out the very best melons and shipped down there, and they have sold as seconds and thirds. I believe that if we shipped nothing but first-class melons it would pay us in the end. These high priced melons are shipped out of this country, and I believe we could educate the people in Montreal to use small melons as well as large ones. Our first-class small melon is much superior to our first-class large melon. I have been growing this year, a salmon fleshed melon. My son bought the seed and never told me the name of it. He is tarred with the same stick as some of our people around there, and does not want everybody to know about his business. We tried the Paul Rose, but it was not a success, nearly all of the melons would crack.

Q.—What do you mean by being cracked?

A.—They split open just before ripening.

Mr. Gorman: You can prevent that. It is the strength of the vine that causes the melon to split. You have got to watch, and just before it starts to crack, you should cut the vine more than half through.

Q.—What do you usually get a basket for your melons?

A.—We get $1.25 a basket for them. We use the same basket that they do in Leamington. Sometimes they go down to 40c a basket. It seems to me that it is hard to tell when a melon is within two or three days of maturity. In our market, we take the stem off, and I would like the stem pulled.

Mr. Gorman: It is just the reverse with us, we are very careful to leave a piece of the stem in.

Mr. Emory: We plant the seeds in April. The nearer the end of April the better. We get the seeds and plant them in sods, making a sod from three to four inches square, and put about three or four seeds in each sod: then put them in hot beds to be planted with soil on top of the manure. Six inches of soil is not too much. We plant them out in the field, the usual time, after we think the frost is over.

Mr. Fraser: I got my seed from P. J. Blinn, Horticulturist at the Colorado Experimental Station, and since we got good seeds we have had better results. There are lots of melons sown around Leamington. We grow everything in green-houses. This year we grew 36,000 tomatoes, and 10,000 melon plants, and 2,000 cucumbers and about 100,000 can-

ning factory plants. The same idea cannot be worked up all over the province. We can easily spend three or four times more on a house than you can get out of it again. If any practical grower comes out my way, I would be pleased to show him my house. P. B. Blinn, Rockyford, Colorado, is the best man to get melon seeds from that I know of. He is thoroughly honest, and sends out the best seeds. We plant our seed about the middle of March, or end of April. As soon as it begins to send out the second leaf, we transplant. We find once transplanting to be sufficient. Some use pots for transplanting, others use boxes. When you transplant your melons into each section, you must have ventilation sufficient to harden them off. If you let them get stunted they will not do as well. Again, you must keep them growing gradually.

Our Association shipped some tomatoes to the west, and they found they will not carry to Winnipeg under ordinary conditions. I don't think that you can make a success of shipping them that far without first putting them in cold storage and cooling them off before putting them in the car. We find that just when the tomato begins to color on one side is the best time to ship them, and if they go at the proper time, they will arrive in good condition.

Mr. Rush: What is your mode of manuring the land?

A.—We put on a good coat of straw manure and plow it down, and if the season is dry, it would not have much moisture, and we would lose a crop. If we put on manure in the spring, we would put it on top and try to work it in. Fall plowing wouldn't do. We don't want too much manure in our soil for either melons or tomatoes.

Mr. Adams, Leamington: J. B. Pollock, of Colorado Springs, was raising the Rocky Ford melons, and they were not coming out good, and one day he found a good vine that was right and he drew the attention of Mr. Blinn to this vine, and they have been experimenting with the result that they have choice melons. They call it the Pollock strain of the Rocky Ford and have recommended that strain as very good. I think that was the best flavored Rocky Ford, that I got from D. B. Benell, Rocky Ford. I think that it is the best flavored Rocky Ford I ever grew. It was a melon of good size. It was completely netted, whether turned or not. My best melons this year were started under glass about May 1st, and transplanted in about two weeks into five inch pots, and planted out about the 10th June. These melons carry foliage through to the end of the season, and with the seed sown in the fall, the ground is almost as bare as that table before the melons were half matured. I got money out of melons I started under glass. I think that it is a good idea to use the glass. We get at the rate of $350, an acre for melons started under glass, and I don't think that we could get $100 an acre for the other melons. Twenty-five cents each is the price we got for melons. These were the "Unsworth Perfect," I got the seed from Mr. Bruce, of Hamilton. We intend to plant about 5 acres next year, because we believe that it is going to make the market.

THE GROWING OF TOMATOES.

By W. C. McCalla, St. Catharines.

I was very much interested in Mr. Gorman's address, not because I grow melons, but because it seems to me that it stands as a type of business in fruit growing and vegetable growing. These industries are going to have a great future in Canada as the country increases in wealth.

Coming along King St. this morning, I saw some English hot-house grapes. They were so beautiful and such a large size that I stepped in the store and inquired the price, and they told me $1.50 a pound; evidently he will sell a considerable quantity. They were beautiful big grapes and perfect in every respect. Over at home this year, there have been many thousand pounds of grapes sold for ½c. a pound to the winers. There are certain classes of people who certainly want 40c. a dozen melons, but this afternoon I am to speak about vegetables that are not nearly so aristocratic as melons at $10 a dozen.

The tomato is one of our great commercial vegetables and one that is going to have a very great future. Last year, at the convention, we discussed tomato-growing under glass, and early tomatoes. The committee did not indicate what line they wanted me to take, and I think that since I have not grown them under glass and have not been interested very largely in the early tomatoes, I would speak chiefly of the main crop of tomatoes. I do not know that I can tell you a single thing new about tomatoes, but after all it is not so much what we know that influences our business and our character, as something that we know so thoroughly that it has taken hold of us and we regularly practice it and make it part of our daily life. While we all may know enough to improve the crop, we do not always put into use the knowledge we have. We are engaged as part of that great multitude whose business it is to feed mankind, and it should be our pride to produce tomatoes and other crops of a good quality at as low a cost as possible. I do not mean by that, that there is any virtue in letting the Canadian Canners' fix the price of tomatoes at such a price as leaves us less than a fair profit, or that there is any virtue in letting the transportation companies absorb most of the profit, but I do not think that it is our business to increase our crops and decrease our cost of production. If we cannot produce tomatoes as cheaply as some other people, we will lose business in the long run.

I would like to mention some of the things that go to produce a big crop of tomatoes. There is always more than one way of doing a thing, and I am not at all dogmatic about what I have to say, but I speak from experience. It is an important factor in the production of cheap tomatoes, to produce a big crop of tomatoes. Of course, the early crop is somewhat different. I am speaking chiefly of the main crop of tomatoes. I do not intend to say anything about the extent of the other business, because to-morrow we are to have an address on the canning industry. To grow a large crop of tomatoes we must get plants produced from a good seed. The plants must be set out in suitable soil and properly ventilated. The crop must be well cultivated and taken care of until it is ready for the market. I will go into the matters in detail.

We need good seed, and by good seed I mean seed that has high germinating power and that will produce tomatoes of a good flavor and of a uniform type such as we desire. When you take two tomato plants grown from the same seed in the same condition, and put them out in different soils, there is a wonderful difference in the result. I had some striking illustrations this year. Good seed is the foundation, and in order to get it, I think that every grower should select his own. It will mean a little work year after year, but I am sure that it will pay. You should not only select the earliest ripening fruits, but you should select fruits from the vines that come the nearest to your ideal of what a vine should be. Place stakes on these selected vines and allow the fruit to ripen perfectly, and gather when thoroughly ripened. Slice off the top of each tomato, and squeeze out the

seeds with the adhering pulp into a pail of water, and let it ferment for 24 hours, and then pour off the seeds and the pulp and wash. Take out heavy seeds and dry quickly, and you will have a seed of bright color and high germinating qualities. They will come up from two to three days ahead of the regular bought article and make a thrifty growth from the start, a growth that you will know is a safe foundation on which to build your crop.

For the late crop we plant our seed the last week in March in hot-beds, putting the seed in flats. When the plants are large enough to handle, in about two or three weeks, we take them out into smaller flats and place these plants in the hot-bed, giving them as much air as possible. We put from 100 to 200 plants into an ordinary flat, made from soap boxes. When these begin to crowd, usually about the first week in May, we put them into frames outside, putting three or four loads of manure in the soil to give drainage. You will remember that it was an exceedingly difficult matter to get good plants this last spring; it was practically impossible to get seedlings out in the cold frames. When the farmers were forced to put them out, they encountered bad weather. I saw 1,000 plants that turned yellow and went back, made no growth for two or three weeks. I am satisfied that a stunted plant, like a stunted hog, is a poor proposition into which to put feed and labor. I have heard men say that you cannot kill a tomato plant; consequently they handle them as roughly as possible. It is hard to kill them, they will stand a lot of abuse, but I am satisfied that abused and stunted plants never give the results that thrifty plants do.

This double handling does not take so much extra time as you would think. I do it nearly all in stormy weather when it is unpleasant to work outside. I like to put them about 4x4 when they finally go into the frames; it makes them thrifty in every way, and they are ready to make growth as soon as they go out into the field. The soil on which tomatoes are planted should have as a first consideration, good drainage, and my preference is for rather light sandy loam, thoroughly underdrained, and I get my best crop from the higher parts of the field. This light soil grows for us the very best tomatoes, potatoes, melons and squash, and a great many other crops. You must be sure that you have it rich enough.

Mr. Rush: What do you mean by this light soil?

A.—Between the surface of the soil and the clay there is a certain amount of not exactly hard pan. Part of it is marl, and there are very fine lumps of gravel in it. For fertilizing the soil for tomatoes, I prefer putting the manure on the previous crop; in fact, I would not like to undertake to grow tomatoes on fairly rich soil with fresh manure. I lost a good many hundred dollars by using fresh manure.

The Chairman: How would it be to take clay loam and loosen it up with manure? Would that do any harm?

A.—No.

Q.—What harm do you get from the fresh manure?

A.—We get such a tremendous growth of vine and it delays the fruit from maturing, and the frost comes before we get the crop off, and we have more rot on that acount on the vine.

Q.—And not so much fruit?

A.—No, if one could get enough manure into the soil to be perfectly manured, I would hesitate to use a commercial fertilizer before trying its efficiency, and seeing whether I really got back enough to make it pay. It costs us nearly three dollars a load to put the manure on the ground, and

we find that it is a good thing to use some commercial fertilizer. I would like to put it on broadcast. I like some standard brand that will analyze about two per cent. of nitrogen, and seven or eight of phosphoric acid, and 10 per cent. of potash, or else a home made mixture of some fine ground bone and phosphate and muriate of potash mixed together. When I did that I put on a light application of nitrate of soda to give the plants a good start. When one is only using one hundred or two hundred pounds of fertilizer, I think that it is best to put it on around the plants. It is merely enough to give them a good start, but if I am putting on the fertilizer to help on the crops, I put it on broadcast.

Q.—Do you like nitrate of soda for tomatoes?

A.—I do not like to use it. My ground is pretty well filled with organic matter and plant food from previous manurings. We work the ground up early, and there seems to be plenty of available nitrogen there to start the plants off. The nitrate of soda is thrown away on a very light soil where early tomatoes are grown. I think that the nitrate of soda will be all right to start them on.

Q.—Do you think that it gets out of the soil quickly?

A.—By using a small quantity. I never put on over a dessert-spoonful around each plant. There is not 16 per cent. of nitrogen in nitrate of soda.

Q.—How far apart are these plants put?

A.—I have found, by experimenting, four and one half feet each way is about right. I have been doing that for a number of years.

Q.—What kind of tomatoes do you grow?

A.—The tomato I have been paying especial attention to is the "Chalks' Jewel" and "Success."

Q.—You never tried the "Pride of Sarnia?"

A.—No, I never have. I have kept my seed of "Chalks' Jewel" for four years, and if I had my entire acreage this year, I would have been $25 ahead on the whole crop.

Q.—Do you put a small frame around each tomato?

A.—Where we get from five to ten acres, I would think it would not pay. It might pay where you were growing them for a special market.

Q.—You would not go in for early tomatoes?

A.—Yes, I have grown them. The Earliana has not as good a color as the Jewel. There are as a few strains that are fairly good, but none that has as rich a color or as delicious a flavor. As ordinarily grown, Chalks' Jewel does not hold its size to the end of the season, but I think that after this year's experience, the canners would prefer the small Chalks' Jewel, put up before any frost comes, to the kind of stuff they put up this year, where a very large percentage of tomatoes were picked off after the foliage was killed with the frost, and they had no color or flavor.

Q.—What do you consider a fair average crop per acre?

A.—I have always stated that there is no money in growing tomatoes unless we get 400 bushels an acre. Of course, the average grown is nothing to that. I was looking over a report which Mr. Rivett has made regarding the canning industry, and I find that the average for Ontario is given as two hundred and twenty-four bushels an acre, which I think would be perhaps, about right. That was based, I suppose, upon last year. I do not think any man could grow that amount and make it pay.

THE CHAIRMAN: He will never be able to ride in an automobile?

A.—No. Last year, when we asked for a higher price, we said that we could not grow tomatoes for twenty-five cents, and one man said that he

could because his wife and family helped him, and he did not have to pay for labor.

THE CHAIRMAN: The days have gone when the gardener's wife had to help in the garden. We thoroughly work our ground in the early part of the season, and we do not have any trouble with weeds. In gathering we usually gather in the tops of one row and put out the tops of the other two rows, and make a roadway so as to get through.

Q.—In your cultivation you keep the ground level?

A.—Yes, we do not ridge them at all.

Q.—You do not believe in hilling up?

A.—I think possibly that when they are first put out it would not be a bad thing to draw the dirt up to them.

THE CHAIRMAN: I fancy they do better when they are thoroughly hilled up.

MR. RUSH: Do you have any trouble with the cut-worm when you put them out?

A.—Not very often; once in a while there seems to be trouble, but I never had any serious difficulty. We did not lose twenty-five plants out of nearly 11,000 this year.

THE CHAIRMAN: If you put in good plants the cut-worms won't attack them?

A.—We use the spade altogether in setting out, because we think it quicker.

Just a word about picking. I find that when you get pickers that have been doing this kind of work for some time, there is a tendency to put in everything. This is apparently due to the feeling towards the canning factories, which is unfortunate for both of us. There seems to be a feeling that anything is good enough for the factories, and they send in rotten ones and everything else; I do not think that it is a good practice. I do not know that it is a wise thing to go into the matter of prices, or cost of production, but I would say this, that I do not know that we can ever blame the canning factories for buying them in the cheapest way. We were beaten in our fight for thirty cents, because the growers would not stick together.

THE CHAIRMAN: At that time we did not have the Vegetable Growers' Association?

A.—It is impossible for any one association to act alone, and I am only sorry that in our own district there are many vegetable growers that do not belong to the Association. If there is anything to be done towards higher prices we will have to act as a provincial organization. The matter of growing a good crop of tomatoes requires attention to details. A chain is no stronger than its weakest link, and if we fall down on any of these points, we are going to have a short crop from the time the seed is planted until it is set out in the field, and they must have judgment, intelligence and industry, and these are qualities that in all other walks of life, command good pay, and I think that the vegetable growers are entitled to something much better than laborer's pay.

There is no question but that the canning factories can afford to pay more than the amount they are paying. The Canadian Canneries are making a profit of 50c for every bushel we take in, so that our profit is extremely small as compared to theirs, and I think that they could afford to pay 5c a bushel more.

THE CHAIRMAN We get $1 a bushel for ours in Kingston, and around Kingston, and I am surprised to hear that you get only 25c a bushel.

MR. RUSH: I think that any man in your neighborhood that could make money growing tomatoes at 25c a bushel should be knighted by King Edward.

MR. DELWORTH: I think that the distribution of our products should be taken up and discussed in the near future. It often happens that one market is over-supplied with goods, and in other markets in the Province there is not enough to go around.

THE CHAIRMAN: Our papers give us the market reports every month, and we reported that we were getting $1 a bushel for tomatoes. I am almost sure to get from four hundred to five hundred bushels of tomatoes to the acre every year. We can grow tomatoes at a fair profit at 25c and yet I know that there is a feeling among tomato growers that 25c for 60 lbs. of tomatoes is the meanest that they have ever been offered. In any other kind of produce we make two or three times what we do on tomatoes, and I am certain that a lot of men are going to drop out, and I think that the factories will offer thirty cents next year.

Q.—Have you any idea what it costs you to produce a crop of tomatoes?

A.—Yes.

Q.—Have you had any trouble with the black rot?

A.—None whatever.

Q.—Chalks' Jewel cannot be grown by us on account of the black rot, partly due to the soil. This year, side by side with Chalks' Jewel, I had the same quantity of land and the same quality, planted with Success, and I am satisfied that we drew out from fifty to one hundred bushels of tomatoes from Success.

MR. DELWORTH: How long have you been selecting your seed?

A.—Four years.

A MEMBER: Last year I grew Chalks' Jewel for the first time, and they were a great success, they did not rot at all. I had the Earliana and Pinks on one side of the Jewels. The Anna's spotted and the Pinks rotted, and this year it was the reverse, the Jewel rotted and the Pinks did not.

MR. W. A. EMORY, ALDERSHOT: I was very much pleased with the paper on "Tomato Culture." I know that the canning factories can afford to pay more for their tomatoes; I have had a little experience in that regard. This year and the year before I was buying for a small canning factory. This year, they wanted me to buy some and I told them that I would not buy any at 25c a bushel. I said that if they paid me 30c and gave me 5c for buying them, I would do so. I paid 30c for the tomatoes, and they gave me 5c for buying them, and they must have cost them 40c laid down at the factory. If a small factory can do that, why can't a large one do it also? I would not undertake to grow tomatoes at all at 25c a bushel. The canning factories will go begging for tomatoes in our neighborhood next year. Some of the growers told me they would not touch tomatoes unless they got 40c a bushel. I don't blame the packers for putting in everything, considering the prices they pay.

SHIPMENTS OF TOMATOES.

By W. T. Macoun, Experimental Farm, Ottawa.

I had a communication quite recently from the Ontario Vegetable Growers wanting to know what experiments we were going to make this year, and I sent them a letter describing the experiments. I think that it would be a good idea if this Association and other Associations would make a list of what they consider the most valuable experiments for them, for the different stations to carry on. For 20 years we have been experimenting at the Central Experimental Farm, and this is the first year we have ever had a statement from any Association as to what experiments they would like us to carry on. We have been working in the dark with the exception of what light we could get from attending such meetings as these and trying to find out what the growers wanted to know.

One experiment I mentioned was with regard to the shipping of tomatoes to the Old Country. Some vegetable growers were interested in shipping there on account of the low prices obtained here. I thought that it might be a good idea to ship some over there, and last spring, we planted a great many more tomatoes than we had in the past, just for that purpose, and I should like to give you some account of the results of these shipments. We grew varieties especially for that purpose. One, the Grogmore, an English variety, very firm and about the size required; the Breedan, a very small tomato, Uniform, and the Honor Bright.

We made four shipments to the Old Country, and I would like to read you some of the correspondence in connection with these shipments, which will give you a good idea of the chance there is for making money out of tomatoes in the Old Country. This is a letter from Mr. Finley, Canada's representative in Glasgow, Scotland, in which he states that growers in England are against the idea, and unless we can have them arrive about the middle of July they will not realize a price that will pay. He says the market is supplied steadily from May to October with Scotch, English, Channel Island and French tomatoes, and then he gives the wholesale prices. The Scotch fourpence to fivepence a lb., English threepence to fourpence, Guernsey twopence to threepence, the British one penny, one-half penny to twopence a lb. He also obtained the following as the retail prices: May, eightpence a lb., July, five-pence; August threepence half-penny.

We made our first shipment about the beginning of September, and they arrived on the 16th. The tomatoes were slightly soft, and the papers covering the tomatoes were damp, and they were not evenly ripened, some being a greenish yellow.

We wrote to Mr. Robert Thompson, of St. Catharines, who ships a lot of tomatoes to Winnipeg, and he informed me as to the kind of boxes they use and the manner in which they ship them. We pack the tomatoes in two rows, and wrap each in tissue paper. We ship the tomatoes that way when they are just beginning to color. We shipped at 6 o'clock in the evening, and they left Ottawa at 10 o'clock, arrived at Montreal the following morning, and were on board the steamer that evening and sailed the next morning. They were about 36 hours out of cold storage. He writes me as to the second shipment as follows: "As far as I can judge the tomatoes were in better condition than last week. Wrapping papers were dry, compared with the last, the fruit was large, and I think more evenly colored, and yet a few in each box were soft. One box I saw had room enough for another row, and at the very end of the box were several rows of soft tomatoes. I

had a short conversation with Mr. Turnbull to-day, and he remarked he had not sold any." The third shipment shows no improvement. They lacked uniformity of color, some being green, others yellowish red. The companies to whom they were shipped said they could not recommend a shipment of tomatoes to England as profitable. There is really no demand for them in the British market, and there is practically, no possibility of tomatoes at the present time, bringing a profit to the Canadian growers. You might strike a good time, but the supply of home grown tomatoes seem to be so large over there now that competition would be too great.

THE MARKETING OF VEGETABLES.

Frank Williams, Ottawa South, Ontario.

The more we study the vegetable business the more complicated it appears to become. The merchant only requires good judgment in buying his goods, attention to the wants of his customers, a reasonable profit, and fair dealing, to make his business a success. The manufacturer works up the raw material by well-defined rules and patterns. The miner seldom meets with new and unknown difficulties. The whole list of our commerce runs pretty much the same way. On the other hand, the successful vegetable grower has the problem of what to grow and how to grow it, which involves details innumerable, and when the goods are ready for market has to rely solely on his good judgment for what he may realize for his product. The following are some of the reasons for this:

In the first place, as nature never repeats herself, no two growers will have just the same size and quality of goods; hence, a variety of prices for the same lines on any given day of the season. Secondly, the manner in which these lines are offered for sale vary according to the fancy or judgment of the individual grower or salesman. Thinking over this problem of the marketing of our crops our conclusion is that there is a good work lying at the door of this Association along these lines. Grading of quality, uniformity and attractiveness of package whether bunch or box, cleanliness of goods and package, together with a respectable outfit and driver, are just as necessary to success in our business as any other.

Grading of Quality.

The poor man cannot always afford to pay for fancy quality, and the rich man will not pay for poor quality. Then, why not grade the goods and get their true value? We believe that in some cases it would pay to throw away the few small inferior ones and not disgrace the bunch or box. I had almost said "yourself," for does it not seem dishonest to try to sell such stuff at the price of a good article? It will be a surprise to most growers when they set this cull stuff to one side to see how small a portion of the crop it is. Generally, the better quality and less bulk will bring more money than the total crop ungraded.

Attractiveness of Package.

Oftentimes boxes several years old that have been used for onions, potatoes, roots, and other work around the garden, may be seen filled with asparagus, snap beans, tomatoes, cauliflower, and so forth. The grower does

not realize that the fastidious customer is generally the one who will pay the price, and that by so doing he is losing many times over in a season the cost of a clean and attractive package.

Uniformity of Package.

Uniformity of package will always give the line a better appearance when offered for sale, and will be found to find favor with the purchaser when giving his order as well as help the grower to keep a record of his crop.

Advertising.

Does it not seem strange that while all other lines of business advertise their goods the vegetable grower has nothing to say for himself or his product? This should not be so. Our business is worthy of better treatment. If you have a good thing let the consuming public know it, and where it comes from. If it is a box or basket, stamp your name and address plainly and prominently on the package. If it is a bunch, tie a label or tag to it. If the goods are right the consumer will want more of them and will soon insist on having yours and yours only. Not only this, but they will also be sure to tell their friends the satisfaction they have had since they have been getting your labelled goods of first quality and even grade.

These suggestions when followed will be found helpful in many other ways. They will have a tendency to bring the business into better system, will help the grower to estimate the value of each crop, and will be found a strong incentive to grow the best and nothing but the best. They will stimulate one quality, so often lacking, of pride in the business, the first and best God ever gave to man.

Wake up, fellow-gardeners, to your opportunities! Along these lines, your business will increase and success will follow.

Mr. J. L. Hilborn, Leamington: I dropped in to learn what I could, and I have no objection to explain our system of marketing; but I do not think that it would apply to the growers here. There is much good advice in this paper. In Leamington, we are growing special lines of vegetables only, for early market. There are some varieties we can produce earlier and better than any other place in Ontario, and we are compelled to send them by express or freight so that our marketing is done in an altogether different way. I have had no experience whatever in growing a full line of vegetables and selling them direct to the retail trade.

Mr. Adams: In this paper of Mr. Williams', he tries to convey the idea that it is a good proposition to throw away the culls, and that may be the fact in many cases. I am a large tomato grower. We have six acres; we call that large. In growing the Earlianas, there are quite a few that come under size; they are perfectly smooth, some might call them culls. We sometimes have tomatoes that run about an inch, they are perfectly smooth. Any man going through the city markets in this country will find a considerable quantity of these tomatoes, put up in one quart boxes, and they bring good prices and I venture to say that there is no market gardener here that would throw away these tomatoes; if he does he is very foolish. I am in the same position as Mr. Hilborn; we grow and ship entirely. We ship these cull tomatoes to Montreal and Ottawa, and I find that there is practically no difference in the prices between cull tomatoes and first class tomatoes in Ottawa. I have sent a considerable quantity to Ottawa, that were worse than the tomatoes I mentioned, and they sold for $1.70 a basket, and first

class stock only brought $1.25. Is there any man here who would venture to suggest that we throw away any of these culls?

We have a lot of men growing melons in our country, and I believe that the majority of them grow culls. I ship no culls if I can possibly avoid it. Our friend, Mr. Emory, last night said he sells everything if he can get anything out of it.

Mr. Emory: No; I said I did not blame anybody for putting everything in where they got only 25 cents a bushel for tomatoes.

Mr. Adams: There may be some here who do not catch the idea as to the quality of the melons. Never buy one that is slick, always buy one that has a thorough net completely around it. I do not mark my crates of melons with any stencil or anything, most of my melons are sold to the wholesale trade. Every basket of tomatoes is marked with a rubber stamp. Most of my No. 1. are sold throughout the Province to the retail trade. We also sell quite a lot in Montreal. One man sold his cherries for 70 cts. a basket, I sold mine for $1.50 and they were shipped to Brandon. I received that price f.o.b. Leamington. I had a report from one man who bought a basket, and he said that there was just one cherry in the lot that was rotten when they arrived there. We must exercise great care in picking and packing these cherries. We should pack them a little on the green side, and then they will arrive in first class condition and we will get a high price.

Q.—What size basket do you use?

A.—12 quart basket for tomatoes, and for melons we use a 16 quart basket. It takes two rows of these Rocky Fords.

Mr. McMeans: I always grade my vegetables, and throw the little ones in the pickle barrel, I find that it pays.

Mr. Delworth: I think it good policy to grade cauliflowers. I have been selling most of my cauliflowers packed in bushel boxes. You can put a dozen pretty nice cauliflowers in a bushel box. We put two layers in a box, and we can put more of the smaller flowers in a box. We have the boxes, some one size and some another, and we sell them for nearly the same price. There are two ways of grading cauliflowers—First by size, and then by quality. As long as I get a good quality of cauliflower, I am not particular about the size. We do not dispose of the culls at the pickle factories, we have a class of buyers in Toronto that are not particular about the quality of the goods as long as they get them cheap, and I think it is good policy on our part, to make the best we can out of our culls by disposing of them to buyers of that class. If we throw away these culls and make nothing out of them, we have to charge that additional cost to producing the article, whereas if we get only a small amount for them and they do not enter into competition with the good article, I think that it pays.

Mr. Emory: We sell our lettuce by the pound, and we get paid for everything that is in it, water and all. I think that the growers in Toronto are working under a wrong principle. I think that it should all be sold by the pound.

Mr. Hilborn: I think by the pound is a better way to sell lettuce. I cannot see how it could be successfully grown and transplanted sold by bunch, and I do not think it should be sold weighing less than ¼ of a pound to the bunch. I know in all other cities where they are making money out of lettuce, they do not think of selling it except by the pound. If I had to sell my lettuce at a price per dozen bunches, I could not get anything out of it to pay for the work, to say nothing of the fuel and other expenses. If you grow small lettuce it takes a lot of work. We have not learned to eat lettuce in this country yet. A city half the size of Toronto, in the United States

would use ten times the amount of lettuce that is used in Toronto. They grow it large and it does not wilt one-half as rapidly as the small bunches. They use it as a food, and here it is used for garnishing and sandwiches, and a little of it goes around. If we could only get our people to use lettuce as a food, as they do in the United States, we could make money growing it.

Mr. WESTON: The amount of lettuce used in London, is ten times the amount it was ten years ago. At that time one grower I knew was getting $1 a dozen for head lettuce, another man started and thought he would run the rest out, and he brought in small lettuce and sold it for 20c. a dozen and that knocked the other man out. Nobody was willing to pay 10c. a head when we could get two small heads for 10c. It worked all right for that man, until the people in London got into the habit of eating lettuce, and the rest of us have profited by that man's experience. There is a different condition in London. There is a great lot of lettuce sold from the wagon and in places where they could not conveniently have scales. Every man that sells lettuce on the market cannot have a pair of scales on his wagon and weigh it out. It is different where you ship it away. I cannot see how you are going to pack lettuce and keep it from breaking off unless it is bunched up.

Mr. SMART, Collingwood: Our market demands bunch lettuce. If we sold lettuce by the pound, we would lose our trade. We ship a good deal of lettuce. You have to give your customers an article the way they want it. If they want to buy it by the bunch, you must sell it that way.

Mr. HILBORN: I think Toronto people are far behind in their education with regard to using lettuce. The growers, perhaps, understand their business, but I do not think that they put lettuce on the market in proper condition to increase trade. The quantity used in Toronto is ridiculously small, and I think it is a good deal the fault of the growers. If you will grow good lettuce, and educate the people to use that kind of lettuce, they will consume a large quantity of it in Toronto, and the sooner you come to it the more money you will make out of the business.

Mr. FRASER: There is a firm in Toledo, that began the gardening business when Toledo was very small. They are men who will not adopt any new system until they have to, but they have built up the lettuce business in a wonderful way. They have only about seven acres covered with glass. They have a night watchman, and they have two or three hundred acres of land on the farm; and they tell me that they would be better off if all their business was done under glass. They grow a few tomatoes, but their chief crop is lettuce and cucumbers. They sell nearly all their lettuce in Toledo; but Toledo is not nearly as big as Toronto. They have five wagons start out every morning to the city. Their lettuce is about two feet high, big heavy stuff, so that if you take off a leaf it will snap. If your lettuce were right in Toronto, I think people would like to eat it.

Mr. RUSH: I am sorry that these men from London and Leamington have the idea that the people of Toronto are not educated to using lettuce. I can tell you that there is one man in Toronto, who handles more lettuce than Mr. Hilborn would have in his green-house. He has one day's sale of about twelve hundred dozen of lettuce. Toronto gets the very best of everything. There is a sale for big lettuce in Toronto, and a sale for small lettuce. Suppose we take the lettuce that Mr. Fraser has just spoken of; that lettuce will weigh about four pounds, and we will put the price down to 10 cents a pound. 12 cents is the average price the year round for lettuce. The "Upper

Ten'' only could afford to buy it if you had to sell it at 40 cents. We do not take advantage of the people in Toronto any more than they do outside. We give them value for their money. I sell any amount of lettuce at $1 a dozen, or ten cents a head, and three for a quarter. The majority of lettuce is wanted in bunches so as to suit all classes of people. The workmen of Toronto use a great deal of lettuce, and they cannot afford to pay forty cents, but they can pay ten cents or five cents, and they get it fresh and crisp and nice. If there is a big demand for lettuce, and we can get the money we sell it when it is small. We have to suit the local markets and conveniences. Mr. Williams' paper is all right, but, as Mr. Adams said, the man would be worse than a fool if he threw away his poor stuff. There are lots of people who would pay more for a basket of small tomatoes than they would for the larger ones. We have all classes of people in Toronto. The population is made up of Japanese, Chinamen, Syrians, Italians, Scotch, Irish and English; and they all like good things to eat and they get the very best. There is no place on earth that is better supplied with vegetables, and all kinds of necessities than Toronto. Why, when people come here from outside and see our stuff put up so nicely, they walk across the street to look at it. You have all heard of the ''Flemish Beauty'' pear; people would come on the market, and you may have the very best of pears, but they say ''I am looking for the Flemish Beauty,'' and if you can get the salesman to say ''That's the Flemish Beauty'' they will buy it; and if you show them a basket of real ''Flemish Beauty'' and say it is something else, they will turn their noses up at it. Mr. Williams has established a business; his stuff is nicely done up, but imagine sticking a tag on every bunch you put up. He must put up 10,000 bunches in a week, and imagine sticking on 10,000 tags. He must get men to work cheaper than I can. I employ a good many men, and I know I could not afford to set them putting tags on bunches for the extra prices I could get. It might be all right for Ottawa, Hamilton, London, or any of these small suburbs of Toronto, but it does not do for the city. I handle hundreds of pounds of this barrel lettuce, and you would be surprised to see how much waste there is. The Toronto people use so much lettuce that we must have it; and if I am short I go out and buy. I was over in Buffalo a short time ago, and they had this big Boston lettuce, they put three dozen in a box, and it was sold by the dozen. I went to a good many commission men, and could not find one place where they sold it by the pound. The lettuce is first shipped in to these commission men, and they ask $1 a dozen. We sell better lettuce in Toronto for 40 cents a dozen, but if they think it comes from outside, it is worth more money. They have got the name for this Boston lettuce, and it is the same with the Grand Rapids. If you tell them it is Boston or Grand Rapids, it is all right. The best lot I have seen came from London, from Mr. Cole; and Mr. McInnis sells good lettuce. They generally put up sixteen dozen in a sugar barrel. It is immaterial to us whether we sell the lettuce by the bunch or by the pound. The Toronto people are satisfied with it, and I tell you that they are educated to eating it. I have had a dozen people at our place, and our girls have cut up what they thought was salad enough, but they would have to cut up a great deal more.

Mr. Fraser: I do not know a man in Canada that is making lettuce pay. Mr. Cole told me he could not make it pay, and one grower around Toronto, told me that in growing lettuce, it was just like changing one dollar for another, and when it came to January and February, it was just the same as giving $1.25 for $1. We are not making it pay, and we had better try to

adopt some plan whereby we can make it pay. You can go to a Toledo grocer and buy 5c. worth of lettuce, or any amount you want. He buys it by the pound and sells it any way he wants to.

Mr. Emory: We should put this on the basis of 16 oz. to the pound, and every man get 100 cents on the dollar, and nothing less.

Mr. Delworth: I think possibly the way it is placed on the market has a good deal to do with it. Of course Mr. Fraser and Mr. Adams are selling to the commission houses, and it is practicable for them to sell it by the pound, but we are selling to the retailer who hands it right out to the customer, and it won't work so easily. I am not in the business so much as some growers, but I handle quite a bit of lettuce; we go in with a load once a week. We have the same route, and I call at the same stores each week with lettuce, and every grocery store takes pretty nearly the same quantity every week. If there is an extra load wanted, we have a telephone at my house, and they can ring me up. I sell it by the dozen. Last winter it was 30c. a dozen. I go to the store and say, "How many to-day?" and they know just what they are going to get. There are five dozen of lettuce in the box, and they are paying $1.50 for it, and they can retail it three bunches for 10c. and if a customer sends an order for 10c worth of lettuce he gets three bunches. They have no weighing or breaking off of leaves. If a man starts selling a barrel of lettuce by the pound or half pound, where is he going to come out at the end? Either the customer has got to buy a lot of broken up leaves that he cannot use or else the retailer has to lose. If we are going to push the sale of our lettuce we must put it on the market in such a way that it will be attractive to the consumer, and then the retailer can make a fair profit with the minimum danger of loss. I think our method is much better than selling by weight. I think if you are going to push the sale of a large quantity of it you should handle it the way we do in Toronto.

Mr. Fraser: You claim it does not pay.

Mr. Delworth: I never said so, and I do not know who said so; I am doing it for a living. I am thankful to say, although I am not a millionaire, and I never expect to be, I am satisfied with my business. There are men in every business who seem to have a way of saying their business does not pay. They may be afraid that others will go into it. I think our business is a fairly profitable one, properly managed and conducted, and I think the way we grow lettuce and rhubarb in Toronto, we are making a living at it.

Mr. Emory: Place yourself in our position; here is a bunch of lettuce, a half pound, and here is a lettuce a quarter of a pound, suppose you had a crop like that. How would you handle it on the Toronto market?

Mr. Delworth: Go back to the first proposition. If I were growing lettuce for Toronto market, I would not grow lettuce weighing a half pound, I would grow lettuce close together, and have it ready for the market quicker, and get more crops a year out of my green-house. I do not think it is necessary to plant lettuce such a distance apart that you have to break it up and tie it in bunches. I do not think it is good business, and I think it will be interesting for you gentlemen to try that experiment with some of your houses. I have done it with part of mine, and I think I am making more money per square foot with the bunch lettuce that I am growing. It seems too bad to break up a half pound head of lettuce. I tried one winter to work up a trade for that kind of lettuce, and I offered it as low as fifty cents, but I found the people preferred twenty-five cent lettuce every time. Some stores would say we can handle a little of that, but it is only one in a dozen

that will pay the price. I leave my boxes in the store, and take out the empty ones when I leave the full ones, and as long as the lettuce is left in the box, it will come out at the end of the week as crisp and nice as it went in. There are no broken leaves or anything else. The last bunch the grocer takes out is just as crisp and nice as the first one.

Mr. PEART: How many crops do they sell by the pound in the winter? You say you sell to the grocer and butcher: the butcher sells his meat by the pound. Why cannot a grocer and butcher sell the lettuce in the same way?

Mr. DELWORTH: All grocer's stuff is sold by the pound. Tomatoes don't come into the market with us before June, and then, of course, tomatoes are sold by the pound until they get cheap enough to sell by the bushel.

Mr. MCMEANS: Mr. Delworth takes his lettuce in and sells it for 30c. a dozen: another man will come along and sell his lettuce at 25c. a dozen, and the retailer sells at the same price. You take a head of lettuce that weighs half a pound and put alongside of it one weighing a quarter of a pound, which is going to draw, the heavy bunch or the small flabby one. I would like to see some growers take the cost of the large bunch and the small bunch, and carry it all the way through from the seed to the consumer and then we could get down to a little more system. I think the people of Toronto are wrong. I do not think they have done enough towards educating the people into this matter of lettuce. I think if you would get a better quality you would sell more; that is my personal experience.

Mr. STEPHEN COURTICE: I said to a man in Toronto, "Why don't you sell by the pound?" and he said, "I can grow three crops where they only get one." It is the conditions in Toronto that are ruling. I think everybody knows that selling by weight is the correct way, and you get the very best lettuce by growing it a good size. The first paper read was a good paper. I have often said that you only have to walk through Toronto to see the rubbish that is exposed for sale, and growers have very little to boast about the stuff they send in here. The growers say that anything is good enough to ship into Toronto. They send any kind of potatoes in here, and the Quebec people are sending nice white, clean, well-grown potatoes .

I have been gardening a good many years and I always throw out the rubbish. If there is a crooked parsnip I throw it out and an undersized carrot does not go in. I always like to put the bunches up attractively so that if a man gets a bunch he gets a good one. There was a man said to me, "Are your potatoes as good at the bottom as they are at the top?" I said, "If they are not as good at the bottom as the top I will make you a present of them." If I have poor tomatoes I offer them at 10c. and for the good ones I charge 25c.

Mr. TRICK, Ottawa: We are pretty near the same in Ottawa as they are in Toronto in growing lettuce. We find that by growing it small we can get off more crops and make more money from the same piece of ground and it suits our customers better. Mr. Delworth has been down there and he knows the conditions pretty well. We have Jews and Gentiles down there the same as they have in Toronto. We take four dozen lettuce and put it into a bushel box and send it to our best customers and they sell three heads for ten cents or five cents a head. Then we have smaller grades that we take to the poorer grocers, where they have the working class who want two heads for five cents and we get fifteen cents and twenty cents a dozen. If you were to take them large stuff you could not sell it. In cauliflower we

put the best in one box and the culls in another. I do not think that we could sell lettuce by the pound down there. Our average price is from twenty-five to fifty cents a dozen in the winter. Last winter it was only forty cents.

Mr. Emory: We have changed the manner of the selling of lettuce in our town by selling good goods. There is an old gentleman down there, who has been selling lettuce for twenty-five years. He started selling this short, lousy stuff—not a man here would buy a cent's worth of it—and we came along with nice lettuce eight or nine inches long and now he has got to take a back seat. Our friend from Ottawa says the other man is in for running him out. Well, if we have got the goods we can sell it. I do not send my stuff to Toronto because the market is no good. I never sent any lettuce to Toronto until this week, and I sent twenty pounds, and from what I can learn I guess I am out of it.

INSECTS THAT TROUBLE VEGETABLE GROWERS AND HOW TO COMBAT THEM.

By Dr. James Fletcher, Ottawa.

Gardeners are not subject to as many difficulties as farmers have in the cultivation of their fields. One of the best methods of doing away with most of the insect enemies, and fungus enemies, and weed enemies of the farm, is the adoption of a short rotation of crops, and where that is done very few of the worst enemies of the farmer can make very strong headway. In gardening it is otherwise. The gardener has to make the greatest use of every inch of his land, and he has to decide which are the crops which will give him the largest return. In that way he has to restrict himself to a few crops. Those who experiment with crops have to wait for their profits, and very few gardeners take up experiments, particularly in these days when the Government is doing that work for them. The practical gardener wants to know which crop, that can be grown in his district, will give him the biggest return. Consequently it comes down to a small number of suitable crops, according to the locality. In nearly all of the stable crops, the insect enemies have been studied to a large extent. Every year we find one or two new pests, and the gardener may be at a loss to know what to do with a certain insect. From the very fact of the small area that is under cultivation and also the expense of that work, the gardener is very frequently in a position that he has to know at a very short notice, what should be done with regard to some injury that he detects on his plant.

The vegetable growers and fruit growers of Canada are to-day so well posted on the general features of their business that it would not be advisable to take up any time explaining the nature of insects, and how the different insects pass through four stages—egg, the larvæ, the pupa form, and then the perfect insect—nor even to point out that different kinds of insects may be classified according to the way they attack your crops. They either suck sap from them, or bite the leaves and consume the substance, and upon these facts you know which remedy to use. If it is a sucking insect, they must be either driven away from the crop or the natural odor of the plant must be disguised by some stronger odor to keep the insects from going to them at all. Those which chew may be killed by placing upon the plant some

poisonous material which will be eaten with the plant. These things are known to the members of the Vegetable Growers' Association, and it is not necessary for us to waste time on them.

The first observation that any gardener should make when he finds his crop is being attacked or in an unhealthy condition, is to ascertain what is the nature of the attack. He should see whether the leaves are being consumed, as is done by the Colorado Beetle. Whether it is a biting or a sucking insect and if the leaves are being destroyed. If the insect is sucking the life out of them, the plants will fade away and die.

Having ascertained the nature of the attack, the next thing is to find out how it should be met. The first consideration is how can the attack be stopped, and the next consideration is how can that be done in the most practical way. Now, insects, as a class, which probably do more harm than others, are grouped under the name of cut worms, caterpillars, and a large class of moths which fly at night and lay their eggs on plants. These eggs hatch and the young attack the crops. Now, the nature of this class of insects,—of which there are about three hundred in Canada,—are so nearly alike that we may grade them all under one head of cutworms. The eggs of some of these moths are laid in the autumn, and they either hatch in the autumn, make part of their growth and then lie dormant through the winter in the soil or in rubbish, and come out at the opening of the spring.

It has been found that nearly all these injurious insects can be controlled by one or two simple methods. When we sow a crop of beets, carrots or onions and find that it disappears suddenly, some think that the crop has been destroyed by frost. I have had them say frequently, that some blight had struck their crop. They do not look for the true reason, which they might find themselves, by removing the soil around the crop and seeing in what condition the plants were. If you find plants have been eaten off, and there is nothing but a rootlet in the ground, you may well know that something has eaten it off and it is not frost or blight, because that would have left the killed plant upon the ground, but where the whole plant is removed you may know that something has been there and eaten it, and you can generally find the cutworms by scraping the soil away a short distance from the plant. The young caterpillars hide in the soil and work only at night. This may be done away with by using bran, ordinary bran mixed with any poison that contains arsenic.

We think arsenic is the most practical, the cheapest and the easiest remedy obtained. Paris green is probably the form generally used. It is a compound of oxide of copper, acid and arsenic, and about fifty per cent. of that material is arsenic, and that is a deadly poison to every animal that eats it, although I have heard a very foolish statement made, that insects will get fat on Paris green and live. It is a slow kind of poison; it may take one, two or even three days, and you do not see the insects being killed. They will go off and hide in the soil, and I do not think that it is worth the gardener's while to find out how they die, as long as he gets rid of them. One pound of Paris green to one hundred pounds of bran makes a good mixture; one-half pound of Paris green to fifty pounds of bran.

If you take a large pan of bran and put a tea-cup full of water in the bran and stir it up until it appears to be perfectly dry, then put the Paris green in, it will adhere to the bran, and will mix finely through it. If you put dry Paris green in bran it will sink through to the bottom almost as quickly as water.

Paris green is not soluble. It has been recommended to mix bran with sugar or salt and water, but it is not necessary, because there is enough flour

in the bran to make the Paris green adhere to it. Sometimes they put off making the mixture because they have not got the bran or sugar. Be careful not to put more than one pound of Paris green to one hundred pounds of bran. If you put in too much Paris green the insects will not eat it, but if you put one pound to one hundred you will find it just gives it a greenish tinge. If you make it too strong it will injure the crop and will not be eaten by the caterpillar, but where it has been mixed properly it will be eaten by the caterpillar in preference to the crop.

In the North-West Territories, sugar beets were attacked by the cut-worm, near Calgary. They extended right through the Mormon country to the boundary, and they swept the fields clean. The farmers at once set to work and made this mixture of bran and Paris green, and the outbreak was stopped, and men who applied the remedy saved their crops, but men who knew so much and said the insects would not eat that stuff, lost their crops, and it is so, wherever there were cut-worms and they tried it. And if you learn nothing elese at this convention, I think that you will say that it has paid you to attend, because I find it invariably successful with the cut-worm that works above the soil.

There are cut-worms that work beneath the soil; they feed on the roots, and these are the only cut-worms you cannot reach by this method.

There are some cut-worms that take on a habit of climbing. The cut-worm that was so abundant in Essex this summer, was the climbing cut-worm, called the Variegated, and the farmers had to do something, and they plowed deep furrows into which these creatures crawled when they were going farther to seek food, and they made holes in these furrows in which to gather them, and destroyed them there; but where the Paris green remedy was used they had protection.

There are certain kinds of cut-worms found in gardens that do a lot of harm. They are practically destroying the tomatoes and cabbages, and these may be protected by simply wrapping round each plant a piece of paper when the plant is put into the ground. We have this paper cut out about the size of my hand, and a man would very soon get into the way of picking up a piece of paper before he takes the plant from the box, thus putting a paper around the plant when it is put into the ground. Two thousand plants that we planted without paper were destroyed, and those that had paper around them were not destroyed, and I think that it paid to take that little extra time and trouble. It is like a man who shaves every morning, it is nothing to him; but the man who shaves every other morning finds it an awful nuisance, while the man who shaves every Saturday looks forward to it as if he were going to have a tooth pulled. A little extra time and labor is nothing compared to having to re-place a crop. The paper will protect a very large number, and it is worth doing.

The Variegated Cut-worm is a climbing cut-worm, and it will climb fruit trees and eat out the buds in the spring, and if the fruit grower would go out in the evening and put a sack or a sheet under the tree and give it a sharp jar, he would see these fellows fall down out of the tree. They can be captured by tying bits of cotton batting around the stump, because the caterpillar will climb up to it, but they cannot climb over it, and it will remain soft a week or ten days, and that will generally protect them enough, because the existence of the cut-worm is very short; but the Variegated will last until July, and it is necessary to keep on with your remedies a little longer. If you know the cut-worms are in the ground you can easily poison them with bran and Paris green, but the more practical way is to prevent them, and to do that you must keep your garden clean from weeds, so that there will be nothing to attract the moths to lay their eggs there. The eggs

of the cut-worm are laid in the autumn by the mother moth, only where there is food for the young, and they are laid where there is vegetation on the ground, and gardens kept clean are less liable to injury the following year by cut-worms. Late crops, also, will attract them.

Another remedy is poisoned baits. Bunches of vegetation tied together, dipped in a strong solution of Paris green, a teaspoonful to a pail of water; one ounce of Paris green in a pail of water. Take these bunches and dip them in a pail of Paris green and water, and then spread them through the garden, ten or fifteen feet apart, and before the crop comes up the cut-worm will eat these bunches and be destroyed.

Another insect which gives a great deal of trouble is the cabbage butterfly. This insect was introduced into Canada about 1860. It was not in this country before this. It was brought over to Quebec, and has spread over the United States and Canada. It reached British Columbia four years ago.

In Manitoba they had fewer insects to fight against; because their gardens were surrounded by large areas of prairie. It is a practice among gardeners to water plants with Paris green and water, and also dust Paris green on the cabbages. I do not approve of this practice, because it is unnecessary. A remedy which is perfectly effective, is to take a mixture of Pyrethum Insect Powder, which can be bought from a druggist or hardware man. One pound of insect powder with four pounds of flour, kept in a close cannister or jars for twenty hours, will give you five pounds of powder which is death to every caterpillar it falls upon. It not only kills by coming in contact with the insect, but if the rains and the dews fall upon the plants the powder then becomes a liquid, and it is quickly fatal. It is sometimes used in the house for killing house flies, by dusting a little in the window, it will kill all the flies in a closed room in a short time.

Cabbages can be kept clean by the use of insect powder and flour. It is injurious to insects, but not to animals or men. It is argued that Paris green cannot do any harm to cabbages because the head comes from the centre; that is perfectly true, but one of the habits of the cabbage is, that the leaves curl down to the heart, and it might possibly be dangerous to use Paris green.

Probably the members of this Association are rather larger growers than many people who ordinarily grow cabbages. I think that it would pay all of you to get one of the bellows that are made by seedsmen to dust on the powder. If you have a small area, the more simple plan is to take about half a pound of the material and put it in a small muslin bag and then tie that with a piece of string to a stick and let it hang from the end of the stick and then another light stick give the bag a tap and just enough of the powder will drop on each cabbage. One little tap and you will have enough of the powder, and you can kill all the insects in that way. We have found it is the easiest way to apply the remedy. But if you have a large area, then the ordinary bellows, by which the powder is blown out by one or two pressures of the handle, is the quickest way. It is more wasteful than the bag method, but time is of importance. That I consider the best remedy for the most injurious of insects to the cabbage.

Another class of insects which we cannot treat so satisfactorily, but which we have to consider every year, are the root maggots—a white maggot which eats the roots of turnips, onions and cauliflowers. The root maggots are enormously abundant some years. In these years it seems almost impossible to control them. There is to-day no practical remedy which will always give us immunity from attacks of these insects. The eggs are laid by small flies, very much like a house fly, close to the ground on a stem or root of the

plant they attack—onions, radishes, cabbages. The eggs hatch very quickly; in about two or three days. They at once bore into the stem of the onion, raddish or cabbage; and if they once get inside, you cannot get them out. The preventive remedy which has given the best results is the tar-paper disk about three inches square, split from the centre to one side so that you can put it around the stem of the plant at the time it is planted. The tar-paper is pressed to the ground, and the creosote in the tar-paper prevents the flies from laying their eggs upon the cabbage; consequently, its roots are not attacked. With fresh tar-paper we find that we can protect a very large number of our cabbages; but, even with that, we have seen clusters of eggs on top of the tar-paper. Last year there was not a single egg laid on any of these plants where the tar-disks were used. They are made very easily with a punch, but the time required to put them on is considerably more than putting the paper around for cut-worms.

Another method which has given us good results at Ottawa is applied about the 1st of July, when the effects of the maggot becomes apparent, and you can generally see the plants which are attacked, by the bluish appearance of the cabbage leaves. I do not advise to treat only those plants which are injured, but you should treat them all. You can draw away the earth from the root of the cabbage and see whether it is injured or not. And we have a preparation of two ounces of insect powder and two ounces of hellebore in an ordinary pail of water. Mix with hot water first, then fill up with cold water. Draw the earth away from the roots of the cauliflower or cabbage and then take a teacupful of the decoction and pour it in. The poison from the insect powder kills any of the maggots that are there around the outside edge of the cabbage or in the soil, and the mixture put on at that time gives the plant a push forward, and it will overcome the effects of the maggot. With us in Ottawa, the beginning of July is the time to do it, and the results have been satisfactory. With the onions the attack occurs very early, and we found, both for onions and radishes, a good remedy is the carbolic wash—what is known as the Cook wash. It consists of one pint of ordinary soap, or one quart of soft soap, dissolved thoroughly in a gallon of hot water, and when it is all dissolved turn into it half a pound of crude carbolic acid—that is, the cheap carbolic acid. Boil that five minutes and then you have your stock emulsion, one gallon. When you want to use that, take one quart to one hundred quarts of water, and use that as a spraying mixture. Put it right along the roots, either with an insect sprayer or with a water pot. You can go along the row of onions as fast as you can walk—ordinary walking. When the onion has appeared above the ground give them that treatment, and a week later give them another treatment and do that about four times in the spring. Then by the time they have made that much growth they will be ready for the market, and it is not necessary to put any more on. It will keep the flies off sufficiently long for you to get your crop of early onions or radishes. In the case of the onions you must watch them longer. If they are in light, sandy soil, I have found a good remedy is to take a broom and walk along the rows of onions and brush away the sand from the tops of the onions. That will take the sand from nearly three-quarters the way down the onions, and unless the sand is well up to the top the maggot will not work there. In heavy soil this is not practical, but in light, sandy soil, I have found it a good protection. If you are growing onions in light, sandy soil, it is well to try that, but the standby is the carbolic wash.

We have not yet any practical remedy by which maggots can be entirely prevented, but in Ottawa I grew good crops of onions when other people close

to me had none. The remedy is not a very difficult one, but is one that is out of the ordinary, the smell of the carbolic drives these insects away. One experiment we tried in a large field of onions where the land had been planted for onions for a good many years, strongly fertilized and kept well up, and grew remarkably good onions. The onion maggot appears suddenly and the whole crop would have been lost. After they had been cleaned thoroughly the cultivator was run through the rows and then a light dressing of gas lime put on. The gas lime is not a practical remedy to recommend, because a supply is not available, but if you happen to be near the gas works it is a very good thing to use. Gas lime is available in some places and is very useful, because the strong odor it gives drives away the flies and the ammonia in the lime makes it a strong fertilizer, although it is dangerous if it comes against the plant. About two bushels to the acre was used in this instance, but that is much more than should be put on a growing crop. That quantity might be put on in the autumn and plowed under in the spring. If that material comes up against the roots it will destroy them. A method adapted lately is that of covering over with a cheese cloth. Where it is done on a small area, it has given very good results, but the lack of light is the chief objection. With cauliflower it gives excellent results and with radishes it gives good results, but on the onions it is not so successful. It can be used on small areas. In amateur gardens I have seen beautiful cauliflowers where none at all could be grown in other gardens.

Grasshoppers were very destructive in Ontario this last summer. Poisoned bran was the only thing that gave good results. A remedy that has given good results in the North-West is known as the Criddle mixture. Mr. Criddle noticed, in driving along the road, that grasshoppers gathered in enormous numbers at certain spots where there were horse droppings in the road, and this was so attractive to the grasshoppers that, instead of paying $20 a ton for bran he took this stuff, mixed it with a little salt and water, and put Paris green in that, and wherever he used it his crops were saved. His neighbors said that they were not going to use any such stuff as that on their fields, and they lost their crops. That would have been practical in some parts of Eastern Ontario and some parts of Quebec last year.

The aphis was only spoken of once or twice—that is a plant louse on the peas. Those of you who remember it, two or three years ago, will remember that is was extremely lively for a plant louse. Instead of remaining in one plant it hopped off as soon as it was disturbed. It made a loss of a million and a half dollars in the pea crop of the Eastern States, and they found a good plan was to have cultivators arranged with brushes in front of it that hit the sides of the rows, and when the plant louse dropped off it was covered up by the cultivator. The pea weevil has almost disappeared, but it is advisable before sowing peas in the spring to notice whether they contain the live weevil, and if they do they might be destroyed in one or two practical ways. The large seed merchants fumigate their peas so that there will be no living pea weevil in them. If there are, you should pour a little coal oil over them or drop them into scalding water that you can just bear your finger in. By putting your seed into that you kill the insect which is inside the peas.

Very often the flea beetle is very destructive in cabbage or turnips, particularly in hot seasons and on certain soils. In growing turnips for the table we have found that the third week in June is not only the best time to sow turnips to get the highest quality for the table but also they will come in between the two periods of the turnip flea beetle. In the spring it lives on any plant belonging to the cabbage family, of which there are

several wild varieties. Until the turnip or cabbage begins to appear above the ground it lives on these weeds and will then fly to the cabbage and turnip, and does great injury because it attacks the seed leaves. They are not true leaves. They are food to feed the young plants: consequently the injury to the seed leaves is very much more of an injury than an injury to the leaves of the plant. The turnip is able to take care of itself when it gets its leaves because it is able to make more leaves than the bettle could destroy: but in the seed beds very frequently the turnip beetle is so strong that their crops will be injured, and you will lose the early market and have the expense of re-seeding. That can be prevented by dusting these plants with Paris green lime. Do it in the morning when there is dew upon the plants. If it is done on a still day, or when there is dew, it will be more effective. Land plaster on certain soils is a good releaser of the fertilizing elements. It is one of the best things to use as a diluter for poison, but it is the poison that does the work.

Mr. Rush: Have you experimented with soaking seed in coal oil and turpentine?

Dr. Fletcher: Yes, I have done that, but it does not have the desired effect. Spraying machines are useful for distributing poison and it is safer for putting on poisons; because dry powder is apt to blow round. Mr. Hilborn's brother is so susceptible to Paris green that he absolutely cannot use it, either wet or dry. I have frequently tried experiments with him, in putting it in the mixture without letting him know, but he cannot use it. It means that the poison is so active that there is some danger in using it dry, but where it is used wet it cannot get off the plants. The cheapest way is with a spraying machine. Spraying machines are of three kinds:—There are hand sprays that can be bought for five or six dollars; the Knapsack Spraying Machine that costs from twelve to fourteen dollars, and there is a bigger machine that costs from eighteen to twenty dollars, or a much more expensive power sprayer.

Some kind of spraying machine is one of the neccessary implements that every gardener should have. It is not only necessary to have a good spraying machine, that is a pump with sufficient power to break up your liquid into spray, but it pays to have the best nozzle you can get. The nozzle is of as much importance as the pump. It is not advisable for me to mention any particular nozzle. First of all, we want simplicity, so that it can be opened and easily cleaned, and put back again without danger of getting out of order. Results cannot be reached if you use a worn out, old nozzle. Those of you who have done any extensive spraying, know that the nozzle is a perishable machine and wears out in a short time. If you use a nozzle all day long you will know that the disk is of no use after end of the first day, and you must have a new disk if you are going to get a spray. You must have one that will not throw up the liquid in drops.

The best way to get at the insect that works under the leaves is to spray them from the opposite side of the row, and it is well to have a bent piece of pipe that you can put under the leaf and drive your spray up. That is one of the things Mr. Fisher recommends in his work against the San Jose scale.

Mr. Rush: There are three insects you have not mentioned that have been very troublesome, the lice on cabbage and cauliflower that come on late in the season, and the slug. I would like to know how that slug breeds. And we have been troubled by the rose bug.

Dr. FLETCHER: The cabbage plant louse, our turnip aphis, is best treated with the kerosene emulsion, coal oil and soap suds. On turnips it appears just when the turnips are being cleaned. The earlier the work is done the better. One spraying will generally check it. The best remedy for the slugs is to use, two or three nights running, just as it is getting dusk, when they come out to feed, a top dressing of freshly slacked lime. The first night they will walk through it. The second night they cannot walk through it, and by the third night they are dried up. In greenhouses a good remedy to use is oatmeal and Paris green put on glass.

The rose bug is the most difficult of all. It belongs to the same family as the June beetle. It flies to the rose plants and from them to the flowers, and it does a great deal of injury every year. The very fact that it does not breed on these plants makes it difficult to treat. If it were only one army you could kill them by spraying with whale oil soap, but where you kill a thousand a great many more come on; but if these patches of land could be cultivated that would check their numbers. But they fly long distances and where they attack rose buds and the flowers of the grapes there is nothing that I can recommend except bagging them. If you can protect the first crop of rose buds or protect the first flowers of the grapes until they are set they will not attack the young grapes. Many years ago Mr. Carpenter wrote me that he had been successful in treating his vineyard with a tarred torch. He simply made a tarred torch and walked through his vineyard and let the smoke on the vines. I tried it, but I did not secure good results.

Mr. RUSH: How does the slug breed?

Dr. FLETCHER: They lay eggs like small glass beads or balls, about as big as number six shot. These are in clusters of about twenty to forty. You will find them two inches below the surface.

Mr. DELWORTH: I have seen the eggs, but I never knew what they were before. Would lime kill these eggs?

Dr. FLETCHER: It would if you could get to them. It is advisable for gardeners to destroy the leaves of all crops that are left over. It is bad practice in digging potatoes to use the potato tops to put over them, because if there is any potato rot in these leaves or stems you put it just where it can injure your crop of potatoes. You may take them in a season when they are perfectly free of disease, and you do not notice anything wrong with the vines, and if you take these potatoes away from the vines they would be free of disease, but if you put the vines on top, and if you have wet weather, you are apt to give your potatoes the rot. If you destroy the potato tops directly your crop is done, you lose that chance of injuring them. There is no particular advantage in covering them up with the tops. It would be far better to cover them up with a little straw, even if you had to draw it from the fields.

Mr. J. L. HILBORN: I had a small quantity of grapes, that I grew for our own use, and I tried bagging a few last year, and every cluster loosened from the stem, and fell off into the bag.

Dr. FLETCHER: I can only imagine that they were not fertilized.

Mr. FRASER: We have trouble in the greenhouse with a dark spot on the cucumber vine, and from that spot up, the vines wilt and die.

Dr. FLETCHER: That is simply that the cucumber vine makes considerable growth and then they fade down and die, then after the fruit is set, in every instance you will find a roughened portion of the stem. It has

been suggested that this is the work of the striped cucumber beetle, but I think that it is more likely to be a fungous disease known as the cucumber wilt. The grub is about one half inch long, transparent and white and it bores inside of the stem of the root and you would have to split the root open to find that it was in it. Land plaster, with about one half pound of crude carbolic acid to the bushel, is a good thing.

Mr. Rush: Is that a little white grub?

Dr. Fletcher: Yes, it is white like glass.

Mr. F. F. Reeves: How long does the kerosene emulsion stay on the cabbage after you put it on?

Dr. Fletcher: It will stay there a couple of days and it washes off very easily. The kerosene emulsion will kill every fly it touches. The tobacco fumes will knock them down, but will not kill them.

A Member: It seems to me that if you use this poisoned bran it will kill the hens and other animals and the wild birds.

Dr. Fletcher: It will not. My chickens have got out and feed among the plants and I never lost a chick. Professor Kay, of Michigan, kept a flock of chicks in a yard where he used it very strongly and I have never found it injure a wild bird. There was a peacock killed in Nova Scotia but the man who put it out, instead of spreading it put it in lumps and the peacock came along and ate one of these lumps. Where you spread it, it is so small that the chickens do not eat it.

Mr. T. Wistow, London: Would that be a good remedy for the white grub in strawberries?

Dr. Fletcher: No, because that grub never comes up. A cure for that is one year rotation and that is the system that is being adopted by most growers now; because you can get a better crop by the one year rotation. Asparagus beetle is injurious in Toronto and west of Toronto.

THE WORK OF THE BRANCH ASSOCIATIONS.

A number of the branches of the Ontario Vegetable Growers' Association accomplished splendid work during 1907. Most of them held meetings that were addressed by their members. These meetings proved so interesting that arrangements have been made with the Superintendent of Farmers' Institutes, by which speakers will be furnished from outside points for the meetings of the branches. Some of the branches have prepared most interesting programmes for the season of 1908. The following reports of the work of their branches for 1907 have been furnished by the Secretaries;

The Toronto Branch.

By F. F. Reeves, Humber Bay, Secretary.

In making out this, the second annual report of the Toronto Branch of the Ontario Vegetable Growers' Association, I think we can safely congratulate ourselves on good work well done. One difficulty we had to contend with last year has been removed, viz., the by-law making all subscriptions due at the annual meeting of the Branch in December. This seemed very unfair to members who entered during the summer or fall, many of them

from July to October. The unfairness, I am happy to say, has been overcome by an amendment to the constitution, made by the Provincial Executive Committee (with the consent of the Deputy Minister of Agriculture, Mr. C. C. James), which makes the membership expire one year from date of application.

The work of the Toronto Branch during the past year, has been very satisfactory and beneficial to all the members. We have held meetings on the first Saturday of each month (with the exception of May, June, and July), at the Albion Hotel, Toronto, all of which were largely attended. At these monthly meetings subjects of interest to the Vegetable Growers were taken up by successful, practical, commercial growers.

At the December meeting, after the election of officers, the members discussed the question of an Appraiser of Vegetables for Ontario. The branch felt that owing to the Dominion Government not having placed a specific duty on vegetables coming into Canada from the United States, we should have an appraiser to see that vegetables that are shipped in are appraised at their proper value. This recommendation was sent on to the Provincial Association for it to deal with.

At the January meeting a very interesting paper on "The Growing and Keeping of Late Celery," was given by Mr. S. Courtice, one of the oldest celery growers in the vicinity of Toronto. This paper was rendered doubly interesting by the fact that Mr. Courtice had specimens of exceedingly well kept celery with him, to illustrate his paper. At this meeting the Executive Committee were instructed to take action to get a representative of the Vegetable Growers' Association on the Directorate of the Toronto Industrial Exhibition. This request was granted to us later by the Board.

The Executive Committee were instructed, also, to get quotations for the purchase of boxes, Paris green, and bunching twine, also to get a copy of the Acts governing the weights of different vegetables per bushel or bag.

At the February meeting arrangements were made for holding the Annual Gardeners' Banquet. This event proved to be the best and most successful in the history of our branch. It was attended by many influential growers and friends. At this meeting Mr. J. McKay brought up the question of lost bushel boxes. It was unanimously resolved: "That after April the 1st all bushel boxes left with purchasers of vegetables be charged for at the rate of twenty (20c), cents each, same to be refunded on return of box.

The action of the Executive Committee regarding the purchase of supplies was endorsed, and the Secretary was instructed to get cards printed giving members instructions where to get supplies and their prices.

It was understood with contractors, that these prices were to apply only to members of the Association who could produce their membership card.

The principal feature of the March meeting was a paper on "Vegetable Growing," by Mr. R. Guthrie, sr., one of the pioneers of gardening in Toronto. The branch nominated three crop correspondents.

In April we were favored with a very instructive paper on "Tomato Growing," given by Mr. A. McInnis, of London, and another paper on "Forcing and Bunching Radish," by Mr. J. W. Rush, of Humber Bay.

At a special meeting held at the end of July, and also at the August regular meeting, the sole business transacted was in reference to the annual excursion.

The annual excursion was held in Hamilton on August 15th. It was very successful and largely attended by members and friends, upwards of 500 being present, among whom we were pleased to see the Provincial President, Mr. R. J. Bushell, of Kingston, also Mr. J. Lockie Wilson, Superintendent of Fairs.

These annual reunions are very enjoyable and prove a great help in getting new members.

During the busy summer months all business was left to the Executive Committee.

In closing my report of the year's work, I would like to emphasize briefly, some of the benefits the gardeners in Toronto have derived from being members of the Ontario Vegetable Growers' Association.

First: The reading of papers on different lines of vegetable growing and marketing by good practical growers, the discussion that follows, and the questions that are put to the speaker and their answers being especially valuable.

Second: The opportunity it gives us to co-operate in the purchasing of supplies. We have proved the value of co-operation this season, especially in the purchase of Paris green, the price of which advanced fully 50 per cent. after we had made our contract.

Third: The system of crop correspondents is also of great value. If you take these with the Bulletins we receive, and our friend and official organ, "The Canadian Horticulturist," I do not see what more a gardener can want for $1.

I enclose herewith copies of our membership card and also supply card sent to members which may prove of interest. I trust that all the branches may have an ever increasing success.

Following is a sample of membership card used by Toronto Branch:—

Vegetable Growers' Association of Ontario

TORONTO BRANCH

Certificate of Membership

This is to certify that.....

is a member in good standing in above Association for 1907.

GEO. SYME, Jr.	R. LANKIN,	FRANK F. REEVES,
PRESIDENT	VICE-PRESIDENT	SECRETARY-TREAS.
CARLTON WEST		HUMBER BAY

CO-OPERATIVE BUYING.

During 1907 the officers of the Toronto Branch made arrangements by which the members of the branch were able to purchase several important

supplies at greatly reduced prices. In this connection the following card was sent to all the members of the branch:—

Ontario Vegetable Growers' Association
TORONTO BRANCH

March 29th, 1907

The members are requested by the Executive Committee to get their supplies from the following firms:—

Bushel Boxes, plain, 15 cents. Hoop Ironed, 17 cents. Wired, 18 cents.

Bunching Twine, 3 ply, 20½ cents per lb. } in 5 lb. bags
" " 4 " 25½ " " }
Paris Green, English (Bergers) 25½ cents, in 1 lb. tins.
" Canadian, 24 cents, in 1 lb. box.

Be sure to take your Membership Card when getting supplies.

GEO. SYME, JR., PRESIDENT, CARLTON WEST — FRANK F. REEVES, SEC. TREAS., HUMBER BAY

The Hamilton Branch.

Thomas Tregunno, Bartonville, Secretary-Treasurer.

During 1907 the Hamilton District Fruit and Vegetable Growers' Association held sixteen general meetings. In addition, the Executive held several meetings arranging picnic matters and other business of more or less importance. All the general meetings were largely attended, and much interest was taken in them.

At the first meeting, held early in December, a series of meetings was mapped out for the winter, and subjects were chosen for each meeting, to be discussed by the members, and other available speakers. The meetings were carried on and conducted as arranged, commencing with Strawberry and Raspberry growing, by Mr. Geo. Awrey, Hamilton, and Mr. W. A. Emory, Aldershot, who gave the members a very interesting talk on the cultivation of these small fruits.

At the next meeting Hot-bed work and the growing of Early Vegetables were taken up by Mr. F. F. Reeves, Toronto, and Mr. J. Lewis, Hamilton. Many pointers were given by members who also asked many questions which the speakers readily answered. The addresses by these practical men helped our meetings very much.

At another meeting Tomato and Celery growing were discussed by local members, Messrs. Crosthwaite and E. J. Mahony.

At another meeting the growing of Red Currants, Black Currants, and Gooseberries, was taken up by Mr. Jos. Tweddle.

At still another meeting Mr. Biggar, of Winona, gave a lengthy talk on spraying for Fungous Diseases and the Currant Worm.

Methods of spraying for Scale and Fungous Diseases were described at another meeting, by Mr. J. F. Smith, Glanford, and by Mr. Jos. Tweddle, Fruitland.

The subjects of Potato and Onion growing were dealt with at another meeting by Mr. Delworth, Weston, and by Mr. Burton, of Hamilton. Much was learned from Mr. Delworth in regard to the sprouting of potatoes.

The members of our branch, also, had the pleasure of hearing Prof. Harcourt, O.A.C., address a meeting, on Fertilizers, and the effects of same on various crops, on different kinds of soil. Other subjects were taken up and discussed by local members at different meetings. In this way we held interesting meetings throughout the season.

On August the 16th, the Association held their annual picnic at the Hotel Brant. It proved to be an even greater success than those former years. Fully 6,000 people attended and many prominent men gave addresses, among them being the President of the Ontario Vegetable Growers' Association, Mr. R. J. Bushell, whose presence was greatly appreciated.

In spite of the fact that our membership roll fell from 81 to 56, as compared with the year previous, our Association had a much better year financially. It closed the year with a bank account of $136.12. The only reason we can give for the falling off of members is that we have been too good to them. We have invited them to attend all meetings, and some of them seem to think that they do not need to become members, as they benefit anyway from the good the Association accomplishes. Our branch is in a very flourishing condition and looks forward to a good year. We hope to increase our membership to what it once was, and with more substantial members.

At the closing meeting held on December 7th last, it was decided to appoint men from our branch to speak at the various branch associations during the comming winter. President R. H. Lewis and Mr. W. A. Emory, of Aldershot, were appointed delegates to the Ontario Vegetable Growers' Association.

The Kingston Branch.

John N. Watts, Portsmouth, Secretary.

On behalf of the members of the Kingston Branch of the Ontario Vegetable Growers' Association, I beg to report that during the year ending November 25th, 1907, the Association has been able to accomplish much valuable work for the benefit of the vegetable growers of this district. Steps have been taken in regard to the Forestalling By-law, which is a great drawback to business on the Kingston market. Letters were sent to the Secretary of the Merchants' Association and also to the Secretary of the Board of Trade, asking for co-operation of said bodies in regard to the abolishing of the Forestalling By-law. It is believed that in the near future this drawback will be done away with as it is a great restraint on trade.

At one of our meetings we were asked what could be done to prevent the Kingston Penitentiary from selling vegetables, in competition with producers of such crops, to retail growers and sellers. The secretary was authorized to enquire about the matter, and did so. He ascertained that the majority of the crop raised on the Penitentiary farm was consumed or made use of by the institution. When there was any surplus it was sold at the market price so that it did not affect our retail market, as it was feared at one time it might.

Another important feature of our work was the procuring of bushel boxes for the market gardeners. The saving thus effected was quite an item in the course of a year.

We first found at one of our meetings how many boxes each one required. The secretary was then authorized to order the boxes from some good reliable factory or firm where they could be purchased for a few cents each. Some of our members preferred slat boxes, while others asked for the tight boxes.

Another very important subject that was considered was the growing of onion sets for the benefit of the members of the branch. This subject will be dealt with more fully at a later date. It is proposed that our members shall take turns in growing all the onion sets that are required for the branch each year. As quite a few bushels are required by our members each year, such action would effect a saving of several dollars a member a year, as our members would not have to pay the high prices gardeners are compelled to pay.

Several other important subjects are under consideration by the members of our branch. One is the question of peddlers and another the giving of twelve to the dozen instead of thirteen. The gardeners are hundreds of dollars out of pocket by not enforcing this important measure. We expect that something will be done to end this practice.

As it was noticed that fruit and flowers, at the different exhibitions, were judged on different points, the following motion was introduced at our meeting held in November. It was moved by John Watts, seconded by A. Knight, and resolved, "That the Kingston Branch of the Ontario Vegetable Growers' Association shall adjust the correct standard and points of excellence on which all vegetables should be judged at the different exhibitions, the points including shape, uniformity, color, and size, and that all persons entering in the work of judging must be supplied with a set of rules laid down by the Vegetable Growers' Association of Ontario."

Our meetings during the year were well attended. There was an average of over nine members at our regular meetings which, considering our small numbers, shows that a deep interest is taken in the work of horticulture in this district.

It was decided not to hold meetings every week as the business to be transacted and the expense of the rent of the hall would not warrant such action. Instead, we agreed to meet at the call our president, Mr. Bushell. We meet about once a month, which is considered often enough.

The Ojibwa Branch.

Edward Dillon, Ojibwa, Secretary.

The Ojibwa Branch of the Ontario Vegetable Growers' Association was organized on the eleventh of January, 1907, and held twenty successful meetings during the year.

While much of our work was of purely local interest, there were several things that may be of interest to other Branches. One of these was our success in purchasing seed, Paris green, berry boxes, raffia, and other supplies. We saved a considerable sum of money to the members of the Branch in this way.

There was considerable discussion of the co-operative shipping of vegetables at the meetings, but the demand for vegetables in Detroit and Windsor was so great that we had no surplus, so we did not have a chance to try this method of selling.

Requests were made to the City Council of Windsor for better Market regulations, but nothing was accomplished. We hope for better results during 1908. A grant of money was received from the County Council of Essex. It was a great help to us in our work.

Great benefits resulted from bringing together growers who followed different lines of work, as a better understanding prevails between them.

We had forty members at the close of the year, and every indication of a good increase at the beginning of 1908.

The Sarnia Branch.

W. A. Broughton, Sarnia, Secretary.

During 1907, the Sarnia Branch held five meetings with a fair attendance at each.

At a meeting in January, the Secretary read an essay on "Potato Growing," and a discussion followed which was both interesting and profitable.

At the February meeting the President, H. Broughton, gave an address on "The Aims of the Association," which was well received.

An interesting discussion took place at one of our meetings on the benefit of using fertilizers. A number of members related their experiences. They favored an intelligent use of commercial fertilizers.

At a meeting in March, Mr. T. C. Wheatley gave a splendid address on "Flowers." Mr. Wheatley was listened too with great pleasure by all, and was given a hearty vote of thanks.

The Association was addressed by Mr. Price, and others of the Sarnia Industrial Club, in regard to the benefits to be derived from a canning factory. Mr. Price pointed out that Sarnia was splendidly situated for a canning factory, it being the best shipping port in Ontario for the growing West. A number of growers spoke in favor of the industry, and all thought that there would be no difficulty in supplying the factory with all that could be handled. It was decided, however, not to push the matter this season, owing to the shortness of time in which to make arrangements.

The Sarnia Vegetable Growers' Association gave donations to the Grocers' Picnic, and to the Agricultural Society. Our finances are in a satisfactory condition. A number of our members are looking forward to having some good meetings this winter. And all consider *The Canadian Horticulturist* well worth the small amount paid for membership in the Ontario Vegetable Growers' Association.

The Ottawa Branch.

T. Mockett, Billings' Bridge, Secretary.

Our branch held nine meetings during the year. At the first of the year the meetings were well attended, and I expected that the branch would grow and that some radical changes, which were badly needed, would be carried out. The Ottawa growers, or rather a majority of them, have the habit of giving thirteen for a dozen. Some of our growers, headed by Mr. T. W. Williams, tried to bring in a motion that twelve only should be given, but this move was defeated and we have lost some of our members in consequence.

A most interesting series of meetings has been prepared for the season of 1908, and we expect as a result to strengthen our Association greatly. This programme is here given in the hope that it may prove of interest to the members of some of the other branches.

OTTAWA BRANCH OF THE PROVINCIAL VEGETABLE GROWERS' ASSOCIATION.

Programme of Meetings for 1908.

All the lectures are free and open to the public. The meetings will be held in Allan's Hall, over 70 Rideau Street, with the exception of the first meeting, which will be in the Canadian Building, 22 Slater Street. Each meeting will be held on the second Tuesday of each month and will begin at 8 o'clock. All persons interested in Market Gardening are welcome.

January 14th—President's Address, Mr. D. Smith. Mr. George H. Clark, Seed Commissioner, "Good Seeds and What they mean to the Vegetable Grower." This meeting will be held in the Canadian Building, Slater Street, seventh floor, in order that the members may be shown how tests of the germination and quality of vegetable seeds are made.

February 11—"The Making and Use of Early and Late Hot-Beds." Early— Mr. S. Baker. Late—Mr. D. Smith. "How to Propagate Fruits." Mr. H. Holz.

March 10—"Fertilizers for Vegetables." Mr. Frank T. Shutt, Chemist, Central Experimental Farm. Discussion.

April 14—"The Best Arrangement and Rotation of Vegetable Crops for Profit." Mr. I. A. Farquharson. Discussion led by Mr. H. Fentiman.

May 12—"Insects Injurious to Vegetables and How to Kill them." Dr. James Fletcher, Etomologist and Botanist, Central Experimental Farm. Discussion.

June 9.—"Some Little Things that Save Time and Money in the Growing and Marketing of Vegetables." Mr. M. Hull, Mr. A. Belot, Mr. R. Bailey, Mr. McConnell.

July 14—"Strawberry and Tomato Growing in the Ottawa District." Mr. W. T. Macoun, Horticulturist, Central Experimental Farm. Discussion.

August 11—"The Most Profitable Flowers for the Market Gardener to Grow for Profit." Mr. H. P. Carstesen. Discussion led by Mr. W. Trick.

September 8—"What Vegetables are Most Profitable to Store and the Best Way of Keeping them." Mr. D. Smith. Discussion led by Mr. F. Fear.

October 13—"Best Fruits for the Market Gardener to Grow." Mr. C. H. Snow. Discussion led by Mr. H. Holz.

November 10—"How to Grow Early Potatoes." Mr. H. McCurry. Discussion led by Mr. Nesbitt.

December 8—Annual Meeting. Suggestions for the New Year. Unanswered Questions. There will be a Question Box at each meeting, and any member may come with questions he would like to have answered. These will be submitted to the meeting and answered by those most competent to do so. During the year there will be discussions on Melon, Celery, Cauliflower, and Onion Culture, as opportunities offer.

THE WORK OF THE EXPERIMENT STATIONS.

Early in the year the officers of the Ontario Vegetable Growers' Association instructed the Secretary of the Association to write to Mr. W. T. Macoun, of the Central Experimental Farm, Ottawa, and to Prof. H. L. Hutt, of the Ontario Agricultural College, Guelph, Ontario, to ascertain what work, likely to be of value to vegetable growers, was being conducted at these institutions. The following replies were received to the requests for information that were made:

Work at the Central Experimental Farm, Ottawa.

From Mr. W. T. Macoun, Horticulturist.

Your letter of March 18th was received in which you ask for a statement as to the work my department purposes doing this year for the benefit of commercial vegetable growers. I am glad that the vegetable growers are taking an interest in our work, for although we are now beginning the twenty-first year of Experimental work with vegetables at the Central Experi-

mental Farm there has been, in the past, comparatively little evidence that the commercial grower has been interested in the work, either in regard to making suggestions for experiments or criticisms concerning the work. During the past twenty years it has been necessary in planning our work to keep in mind the needs of the great majority of the people who grow vegetables, namely, the farmers and the amateurs in cities and towns, as these, in our judgment, required aid more than those who were making vegetable growing a business, and who, though they needed help, did not need it so much as those who were comparatively unfamiliar with the best methods of culture. The needs of the commercial grower were, however, not overlooked, and in the twenty reports which have been published by the *Horticulturist* we believe that there is much that should have proved of value to the commercial grower.

I have premised the information in regard to this season's work with the foregoing statement in order to make clearer what has been our aim and what we still believe should be our chief aim under present arrangements. I shall be delighted to receive suggestions for experimental work from the Vegetable Growers' Association, and, if practicable, shall be pleased to carry them out.

1. As the question of varieties affects all the different kinds of vegetables it may be well to state at the outset what our practice now is in regard to them and what will be done this year. During the twenty years in which we have been experimenting many hundreds of varieties of vegetables have been tested. For some years now we have published, from time to time, a list of what was considered the best of them. Our present practice is to test the varieties recommended each year and usually a few others almost or quite as good, and in addition to them the novelties offered each year, growing these for several years until we are sure that they are better or worse than the varieties already tested or merely synonyms of them.

2. This year we are planning to plant about an acre of tomatoes of a few varieties found to be the firmest, our object being to make trial shipments to the Old Country during the summer. This experiment is, we believe, in the best interests of the commercial grower.

In growing tomatoes for these shipments we purpose adopting a simple method of pruning which we have been experimenting with for the past three seasons whereby we get a much larger quantity of ripe tomatoes early in the season.

3. Our experiments in the comparison of early varieties of potatoes will be continued this year. Our plan is to dig the potatoes twice a week beginning when the potatoes are first marketable or just before they are first marketable, and continuing for about a month, notes being taken at each digging of the number of marketable and unmarketable tubers.

Another potato experiment which is, perhaps, of interest to the commercial vegetable grower is the testing and selecting for resistance to blight, a work begun in previous years.

4. The testing of the keeping qualities of different varieties of celery will be continued to get further information upon this point. If practicable, different methods of storing will be tried.

5. The selection of tomatoes, beans and peas which has been going on for some years will be continued. The object of this work is not so much to get new strains of seed for distribution as to show the importance of each grower saving and selecting his own seed. The advantages of selecting for earliness has been very marked in the case of tomatoes, beans, and peas.

While some growers practice this method it is not generally known just what the advantages are. By taking regular notes, as we do here, it is possible to come at this more accurately.

6. For several seasons we have carried on a test to learn the relative value of different varieties of lettuce for summer planting, notes being kept on the time they are ready for use and the length of time they remain so in the field. The difference in the several varieties has been very marked.

7. The resistance of the various strains of late cabbage to rot has been carefully noted. This will be continued this year.

8. The relative freedom of different varieties of beans from anthracnose has been noted. This will be continued this year.

9. For several seasons the yield of green peas from rows, 100 feet long, of some twenty varieties of peas has been recorded giving a fair estimate of the relative value of them to the commercial grower. New varieties are added from time to time. This line of work will be continued this year.

10. It is important to know the varieties of early tomatoes which produce the most ripe fruit early in the season. Records are taken of the yield from each picking and the dates of each.

11. In addition to these the best known methods of treating injurious insects will be tried and any new methods suggested by the entomologist. Fungous diseases, also, will be dealt with and the information obtained will be available to the commercial grower.

There are other experiments which are perhaps of more interest to the amateur than the commercial grower and need not be given here.

Work at the Guelph College.

From Prof. H. L. Hutt.

In answer to your letter of the 18th inst., you may inform the Directors of the Vegetable Growers' Association that most if not all of the departments of the College are engaged in investigation work that should be of interest and value to the Vegetable Growers, as well as to others of the agricultural community.

In the Horticultural department in particular, extensive investigation and experimental work is in progress, and results will be published from time to time as may be expedient. In the meantime, Mr. McMeans, who is on your directorate, can conveniently give the other members of the directorate any particulars desired at any of your meetings. This he has authority to do. Any assistance we can render the Vegetable Growers in solving their problems in vegetable growing will be gladly given, and visitors desirous of information are made welcome at any time.

THE VEGETABLE CANNING INDUSTRY.

By T. B. Reivett, B.S.A., Department of Agriculture, Toronto.

When I consented to give an address at this convention on "The Vegetable Canning Industry," I did not at the time realize the vastness of the subject and necessarily the different phases of it which have a more or less direct bearing on the different classes engaged in its production and manufacture. I am not a practical canner, nor have I been practically engaged in the production of material for canners; therefore, I can only deal with the sub-

ject in a general way, giving you to some extent some of the observations I gained by visiting all the factories in Ontario, and also by interviews with some of the principal growers of products for the factories. In order that you may grasp the importance of this industry, it would be well to give you a slight idea of its development. By so doing, you will be more able to appreciate the extent of its future.

The canning industry was started some twenty-six years ago in Prince Edward county. At that time the machinery and appliances were very inadequate, and the prejudice of the consumer, together with the difficulty of conducting and interesting the grower, had to be overcome. But with the advent of new machinery, which did away with an immense amount of hard labor, resulting in an improvement of methods, and enabling the manufacturer to produce a cleaner and cheaper article, which together with the adaptability of the people and the country, the development of this branch of industry has been most marked and the consumption is to-day practically universal. In 1881, Mr. Wellington Boulter and Mr. Barker started two factories in Prince Edward county. From 1884, the development has been very marked. In the different sections of the Province factories have sprung up, and since then have continued to be erected, especially within the last eight years.

The chief feature of the development of this industry occurred in 1903, when a deal to amalgamate and get control of some 35 factories situated in every section of Ontario, and having in their production a complete pack, was successfully carried through. This syndicate of factories is known as "The Canadian Canners," and the company has now some 30 factories in operation, but I do not think that they have a very great influence on the question of production.

There are 30 independent factories distributed throughout Ontario, some of which are in direct competition in the buying of produce, especially in Prince Edward. There are four other factories which utilize a small amount of vegetables, but principally devote their energies to the preserving of fruit.

In the past twenty-six years the number of factories has increased from 2 to 64, the amount of labor utilized from practically few to 6,758, comprising 4,215 women and 2,543 men with an average total wage during the busy season of $10,137 per day. The amount of produce has increased from almost nothing to, as follows:

Tomatoes,	5,636	acres	producing	1,297,150	bushels	valued	at	$336,496
Corn,	8,707	"	"	20,400	tons	"	"	144,777
Peas,	3,442	"	"	5,219	"	"	"	141,060
Beans,	357	"	"	658	"	"	"	20,160
Pumpkins,				655	"	"	"	1,828

These figures give a total of 18,232 acres, 65,775 tons, valued at $644,321. This value only represents that of the five crops mentioned. Such articles as asparagus, cabbage, cauliflower, celery, beets, rhubarb, onions, cucumbers, etc., would add to the total, but the production of these is practically confined to a few sections where the over-production is sold to factories, except in cases where contracts exist.

I have given some idea of the present state of the industry. These figures in comparison to the present population of Canada should impress upon you some idea of its future development when the country is developed and population increases.

There is one feature in connection with this industry which seems very closely related to the farmers, namely, the increase of factories in which the controlling interest is owned by the farmers. In such factories, the farmer not only derives the benefit from growing the produce, but shares the profits of the investment. These conditions should stimulate every shareholder to be more thorough in his cultural methods, choice of variety, and production of a higher grade of produce which would result in lessening the waste at the factory and in the production of a higher quality of pack.

The first attempt to operate such a factory was at Leamington, a district well suited for such an enterprise; but, after a year the stock was sold to Mr. McGregor at, I believe, below par. The second attempt was started in Prince Edward County in 1904 and is known as the Farmers' Canning Co. It is still in existence, and apparently doing a good business. This year another factory of the same type was started at South Bay, Prince Edward County, and has a capital of $40,000.

The question then arises: To what was due the failure of the attempt of the Leamington farmers, and why should not farmers operate factories of their own in different sections? The farmers of Leamington failed for no other reason than lack of unity and proper organization. The farmers of Prince Edward County succeeded because they better understood the methods of production, and realized more thoroughly the details of management than those at Leamington.

There are two great inducements for the farmer to invest in such an enterprise: first, the opening of new and productive channels for his operations on the farm, and second, the probability of making from 10 to 15 per cent. on his investment. With these two incentives, it seems rather an easy proposition to induce farmers to invest, but the factors governing this industry must be looked into. One has indeed overcome the problem of production, but he has the greater task of establishing his brand and mastering the problem of distribution. He has also to face the question of demand and supply, and I would advise no farmer or vegetable grower to invest until he has satisfied himself as to the favorable relationship of these factors. Having done so, I do not think that there is a more profitable industry, and one which has a more direct and beneficial result on himself and his community at large than the canning industry, and should these factories increase and continually amalgamate, their position should carry great power.

Type of Produce. One of the most important factors in growing produce for the factory is the production of a type that will be most economical to the manufacturer and at the same time profitable to the grower. Very little attention has been paid to this factor either by growers or canners. The chief reason for this is, apparently, that no inducement has been held out to the producer in the shape of financial remuneration. Of all the crops which at present seem to require strenuous efforts to produce a more economical type are tomatoes and corn. With others, the type is apparently satisfactory, and the problem of production becomes a comparatively easy one.

Tomatoes. The type of tomatoes which the canner requires is one that is very smooth, of a medium size, one that ripens to the stem, possesses a rich red color, and a fair degree of firmness. A large rough tomato which does not ripen to the stem, is clumsy to handle and necessitates a considerable waste in peeling. A watery tomato, or one that lacks firmness, is wasteful in the filling process, and will only produce eight or nine cans to the bushel, while a firmer sort will give 14 to 16. The question of color is not so important, as vegetable coloring matter may be used without detriment

to the pack, yet color is a factor too important to disregard in choice of variety.

Corn. The ideal type of corn is an ear of good size with a small cob, and deep sweet tender kernel. The smallness of cob minimizes the waste in graining, while the other qualities tend to render processing easier and the quality of pack better.

Other crops such as peas, beans, pumpkins, cabbage, asparagus, beets, cucumbers, cauliflower, etc., have, as it were, a fixed type, and the varieties grown to-day possess the required type although they may lack other varietal qualities such as productiveness, size, etc.

Varieties. In choosing varieties, one has to consider a series of different factors, as the types required of different crops vary, and local advantages and disadvantages both in soil and climate play a very important part in governing selection, for apparently there are few varieties which will give the same results on the same and different soils in different sections of the country. For instance, in selecting varieties of tomatoes, the farmer's first consideration is prolificness and earliness. After this he is governed to some extent by the type required by factories. Earliness in maturity is the most essential in choice of variety in Ontario. Our seasons are short and many of our best varieties are too late in maturing, resulting in a loss through damage by frost.

Our early varieties are in many cases productive, and ripen most of their fruit, but their irregularity in type and the large percentage of moisture they contain render them less valuable from the economical point of the canner than later ones, while, on the other hand, their earliness enables him to commence operations earlier and in this way increases the size of his pack.

The difference between type and variety in that type is the standard of essential characteristics by which variety is chosen ,and variety is the specific difference between plants and fruit of plants, which belong to the same genus and species. There are many varieties when grown under proper conditions that fulfil to a great extent the requirements of type, yet when these varieties are grown under different methods of culture and kinds of soil, the variation of type is very great and sometime unsatisfactory. Have we then the desired varieties? and are these variations of type due to our cultural methods, selection of soil, and seed?

We have some very good varieties; yet these varieties, as we find them at the factory, vary to a great extent. The kind of soil may have some effect on size, productiveness, firmness, and color, but the greater variations are due directly to our seed. It has been suggested that, to obviate the problem of seed selection, the farmer should grow his own seed. The suggestion is a good one, but few growers understand the methods of selection, and can afford the extra time to carry out this plan, as it necessarily entails a great increase of labor and exactness. Some have attempted it and have met with a certain amount of success and failure.

I remember looking over a lot of tomatoes brought in by a farmer who had saved his seed for the past six years, and I must say that I have seldom seen such a conglomeration of different types. His failure was apparently due to the lack of appreciation of the first principle of selection, namely, that the inherent qualities of a plant are not produced in the individual fruit but in the plant, and that in selection one must choose, not the largest fruits from promiscuous plants, but rather fruits which are borne by plants that have a greater percentage of the desirable fruit. While the system of home selection is an admirable one, and should be encouraged everywhere, yet it should be urged on both the farmer and the management of factories who supply most of the seed, to buy their seed from seedsmen who make a specialty

in growing the varieties of which they are in need, and not to buy all their seed from one firm in order that they may save a small percentage in expenditure. It would seem that, if this principle was closely adhered to, such variations that exist now would not be so prevalent.

List of Varieties Grown by Farmers for Canneries.

Beans. Refugee, Golden Wax.
Corn. Crosby, Early Evergreen, Stovell's Evergreen, Hiccox, Old Colony, Country Gentleman.
Peas. Alaska, Advancer, Horsford Market Gardener, Glory.
Tomatoes. Earliana, Chalk's Early Jewel, Livingston's Favorite, Success, Matchless, Ignotum, Stone, B. B., Worden.
Beets. Egyptian Blood Red.

Prices Paid and Cost of Production.

For the past three or four years there has been a great deal of agitation on the part of the growers of produce for canning factories for an increase in the prices paid. This agitation which started in the Niagara Peninsula has gradually spread throughout the Province, and nearly all the farmers who have been growing produce for two or three years feel that the prices should be higher, especially for tomatoes. There are, however, two sides to the question, namely, that of the grower and that of the canner.

The grower feels that he has to run a great many risks, the most important being weather conditions. These he is practically unable to avoid, especially in the case of early and late frosts. In many cases, the expense and loss in time in delivering his goods and in getting crates for tomatoes and waiting his turn at the factory are very great. He also has the desire to sell his produce for the highest prices possible, and is not willing to slave for small margins.

On the other hand, the factories are in business to make money. They desire to buy their produce at the lowest possible rates, and their number being few and their managers being business men, they all buy on practically the same basis.

Two years ago, the farmers of St. Catharines asked for a raise in the price of tomatoes and refused to grow unless their request was granted. What was the outcome? One factory paid the required raise, while the others simply refused. They persuaded some of the growers to continue growing at the old rate, solicited new ones and imported what portion was necessary. This gives an idea of how the factories at that time received such a proposition, and shows very plainly the futility of any community demanding any raise unless the producers to a man uphold the move, and are supported by fellow farmers who are not producers. This co-operation must not only take place in any one locality but must be throughout the whole Province. This seems almost an impossible undertaking unless a good deal of time and money is spent by the Vegetable Growers' Association.

How then are the farmers to induce the factories to meet their demands? The easiest and probably the most successful course is to use persuasion and proof. This, however, must be backed by organization.

During my visits to the factories in Ontario, I was very much impressed by the total lack in grading of produce and buying on this basis. For instance, in some vegetables such as corn, peas, beans, tomatoes, there is a great deal of variation in the quality produced by the different farmers outside of the varietal differences. Some growers produce a grade that will

pack very economically, while others do not seem to be able to do so. I should strongly advise the farmers to approach the canner for a new price list based on grade, epecially in the case of tomatoes, as not only would the system stimulate the farmer to produce better produce and more of it, but it would also benefit the canner by enabling him to pack better grades, or at least have a greater differentiation between them.

The following are some figures that have been given me by growers which to some extent represent the approximate cost of production of some kinds of produce.

TOMATOES.

———	Rent.	Plowing, fitting, marketing.	Plants or seed.	Planting.	Cultivating and hoeing.	Picking and hauling.	Estimate of time lost at factory in dollars.	Manure.	Total.
	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
1	8 00	4 00	11 50	2 50	8 00	21 00	.....	10 00	65 00
2	5 00	6 50	7 50	3 00	6 00	14 00	.....	10 00	52 00
3	10 00	3 00	9 00	2 00	10 00	12 00	.....	2 50	48 50
4	3 00	3 00	9 00	4 50	15 00	11 00	10 00	2 00	57 50
5	10 00	5 00	7 50	3 00	10 00	12 00	.....	6 00	53 50
6	5 00	6 00	7 50	3 00	10 00	18 00	.....	6 00	55 50
7	3 00	6 00	8 00	2 00	6 00	15 00	.....	.....	40 00
8	6 00	3 00	9 00	3 00	4 00	10 00	1 50	12 00	48 50
9	3 00	5 00	10 00	3 00	6 00	28 00	4 00	5 00	64 00
10	5 00	7 50	13 50	4 50	17 00	24 00	.....	18 00	89 50
11	8 00	15 00	17 50	10 00	14 00	28 00	.....	15 00	107 50
12	5 00	4 00	14 00	4 60	12 00	25 00	2 00	10 00	76 00
Average	5 92	5 67	10 33	3 71	8 17	18 17	1 46	8 04	61 46

CORN.

	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
1	8 00	2 00	1 00	50	5 00	2 00	5 00	1 00	24 50
2	5 00	6 00	50	50	5 00	4 00	.....	3 00	24 00
3	3 00	5 00	50	50	6 00	6 00	.....	.....	23 00
4	3 00	5 00	50	50	4 50	4 00	.....	5 00	22 50
5	5 00	2 25	50	25	.....	1 00	25	2 00	11 25
Average	4 80	4 05	60	45	4 10	3 40	1 05	2 20	20 65

BEANS.

	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
1	5 00	4 00	2 00	1 00	5 00	24	.....	5 00	47 00

PEAS.

	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
1	3 00	3 00	6 75	50	.....	13 00	3 00	3 00	32 25
2	5 00	6 00	7 50	40	.....	6 00	.....	.....	24 90
Average	4 00	4 50	7 12	45	.....	9 50	3 00	3 00	31 52

As stated above, it should be particularly noted that these figures have been furnished by growers themselves. They are given for what they are worth, but are, of course, limited in their application, especially as such a small number reported. They serve, however, to call attention to the fact that few growers actually figure out what individual crops cost to produce. The items for rent and labor must be considered from different standpoints as in most cases, part at least of these are returned to the grower, as they represent his own work or that of members of his family. Again, the item of time lost at the factory is apt to be exaggerated, and is perhaps already partially provided for in the cost of hauling.

Based on the above figures for cost of production, any profit will depend on the yields. At 300 bus. of tomatoes per acre, the net returns to the grower will figures out as follows:—

300 bu. at 25c.	$75 00
Cost of production	61 46
Net profit	13 54

With a crop of 400 bushels, the returns are increased proportionately, the only increase of expenditure being that of picking and hauling, but when the crop decreases to 230 bu. per acre (the average for the Province) the margin of profit is a very narrow one. So to secure a fair return for his labor, the grower should endeavor to increase the number of bushels raised to the acre by greater care throughout the entire season.

The results of such care and perhaps more intensive methods with these crops is shown in the following report for the past two seasons from a northern tomato grower: In 1906, this man planted 12 acres of tomatoes, varieties principally Earliana and Chalk's Early Jewel, from which he sold 5,796 bushels. These were disposed of as follows: 3,107 bus. to canning factory at 25c. per bu.; 2,689 bus. in 11 quart baskets to market. Total receipts $2,794 24, less cost of baskets, $322.76, leaving a balance of $2,471.48. In 1907, he planted 17 acres to the same crop and varieties, selling therefrom 5,200 bushels, 1,575 bus. going to the factory at 25c. per bus. and balance in 11 quart baskets again to the market. The total receipts were $3,192.80, cost of baskets, $487.33, leaving a balance of $2,705.47. These balances, of course, include the items of expense given in the above tables and are not net receipts.

As this question of the cost of production is such an important one, the Department of Agriculture would like to receive reports on any of these crops from growers who have kept accurate account of the expenditure and receipts.

THIRTY-EIGHTH ANNUAL REPORT

OF THE

ENTOMOLOGICAL SOCIETY OF ONTARIO

1907

PUBLISHED BY THE ONTARIO DEPARTMENT OF AGRICULTURE, TORONTO.

PRINTED BY ORDER OF
THE LEGLISLATIVE ASSEMBLY OF ONTARIO.

TORONTO:
Printed by L. K. CAMERON, Printer to the King's Most Excellent Majesty.
1908

WARWICK BRO'S & RUTTER, Limited, Printers,
TORONTO.

To the Honourable Sir William Mortimer Clark, K.C.,

Lieutenant-Governor of the Province of Ontario.

May it please your Honour:

I have the pleasure to present herewith for the consideration of your Honour the Report of the Entomological Society for 1907.

Respectfully submitted,

NELSON MONTEITH,
Minister of Agriculture.

Toronto, 1908.

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THIRTY-EIGHTH ANNUAL REPORT

OF THE

Entomological Society of Ontario,

1907.

To the Honourable Nelson Monteith, Minister of Agriculture:

SIR,—I have the honour to present herewith the Thirty-eighth Annual Report of the Entomological Society of Ontario, which contains the proceedings of the Forty-fourth Annual Meeting of the Society. A full account is given of the discussions upon fruit-tree insects that took place, the papers that were read and the reports of the various Officers, and Branches of the Society. Since the removal of its headquarters to Guelph and its more intimate connection with the Ontario Agricultural College, its activities have been increased and its work carried on with much enthusiasm and success.

The Canadian Entomologist, the monthly magazine of the Society, has been regularly issued during the year and has now completed its thirty-ninth annual volume. Its high scientific character has been steadily maintained.

I have the honour to be, Sir,

Your obedient servant,

CHARLES J. S. BETHUNE,
Editor.

Ontario Agricultural College,
Guelph.

Entomological Society of Ontario.

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Silcox, Sidney ..... St. Thomas.
Slater, A. E., O.A.C. ..... Guelph.
Smith, A. ..... Renfrew.
Smith, Walter ..... London.
Stewart, J. ..... London.
Stuart, F. A ..... "
Tanton, John ..... Uxbridge.
Thompson, W. Robin, O.A.C . Guelph
Treherne, R. C., O. A. C. ..... "
Walker, Dr. E. M. ..... Toronto
Watson, Dr. A. H. R. ..... Port Hope.
Webb, J. H. ..... Toronto.
Wheaton, R. R., O.A.C ..... Guelph.
White, James ..... Snelgrove.
Williams, J. B. ..... Toronto.
Wood, A. A. ..... London.
Wood, S. T. ..... Toronto.
Yerex, O. E ..... Little Britain
Young, C. H. ..... Ottawa.
Zavitz, E. J., O. A. C. ..... Guelph.

Province of Quebec.

Barwick, E. C. ..... Montreal.
Begin, Rev. Abbe, P. A. ..... Sherbrooke.
Bickell, Miss. ..... Quebec.
Boulton, A. R. M. ..... "
Boulton, Mrs. ..... "
Bowen, Miss. ..... "
Brainerd, Dwight ..... Montreal.
Brainerd, H. ..... "
Burgess, Dr. T. J. W. ..... Verdun.
Chagnon, Gustave. ..... Montreal.
Clark, Rev. Wylie, C. ..... Quebec.
Davis, M. W ..... Montreal.
Denny, E. ..... "
Dunlop, G. C. ..... "
Elliott, W. R. ..... Sherbrooke.
Faulconer, Mrs. ..... Levis.
Faulconer, Miss Clare. ..... "
Fosberry, C. S. ..... Montreal.
Freeman, Miss I. H. ..... Quebec.
Fyles, H. ..... Levis.
Fyles, Miss W. ..... "
Fyles, Mrs. ..... "
Fyles, Rev. Dr. T. W. ..... "
Geggie, James ..... Beauport.
Geggie, Miss Lois. ..... "
Gibb Lachlan. ..... Montreal.
Griffin, A. ..... "
Hamel, Miss Julia. ..... Levis.
Hedge, Miss Louisa ..... "
Huard, Rev. Victor. ..... Quebec.
Johnston, Miss M. G. ..... Levis.
Kollmar, E. J. ..... Montreal.
Lindsay, Col. Crawford ..... Quebec
Lochhead, Prof. ..... Ste. Anne de Bellevue.
Lyman, H. H. ..... Montreal.
MacLeod, Miss E. ..... Quebec.
Moore, G. A. ..... Montreal.
Newman, C. P. ..... Lachine Locks.
Norris, A. E. ..... Montreal.
Poston, Mrs. T. A. ..... Levis.
Reford, L. ..... Montreal.
Robertson, Miss. ..... Quebec.
Seton, Mrs. W. W. ..... Levis.
Simmons, J. H. ..... "
Simmons, Mrs. J. H. ..... "
Southee, G. R. ..... Outremont.
Swaine, J. M. ..... Ste. Anne de Bellevue.

Tourchot, A. L.....St. Hyacinthe
Turnbull, Lt.-Col. F.....Quebec.
Turner, Hon. Richard..... "
Turner, Mrs. R..... "
Wade, Miss.....New Liverpool.
Weir, Douglas.....Montreal.
Winfield, Mrs.....Quebec.
Winn, A. F.....Montreal.
Wood, Rev. Edmund ..... "

ALBERTA.

Baird, Thos.....High River.
Dod, F. H. Wolley .....Millarville.

BRITISH COLUMBIA.

Abercrombie, Miss Ivy.....Vancouver.
Anderson, E. M.....Victoria.
Anderson, J. R .....Victoria.
Armstrong, E. W .....Salmon Arm.
Bryant, T. .....Vancouver.
Bush, A. H..... "
Cockle, J. W.....Kalso.
Danby, W. H.....Rossland.
Dashwood-Jones, W. A.....New Westminster.
Day, G. O.....Duncan's Stn.
Draper, R.....Vancouver.
English T. M.....Cowichan Stn.
Findlay, Rev. G. H.....Fort Steele.
Foster, F.....Vancouver.
Grassham, R. T .....Keithly Cr'k
Hanham, A. W.....Duncan's Stn.
Harvey, R. V.....Vancouver.
Keen, Rev. J. H.....Metlakatla.
Livingston, C.....Duncan's Stn.
Luscombe, P.....Cowichan Bay.
Marmont, L. E.....Vancouver.
Marrion, H.....Vancouver.
Reed, E. Baynes.....Victoria.
Sherman, R. S.....Vancouver.
Skinner, E. M.....Duncan's Stn.
Taylor, Rev. G. W ..... Wellington.
Towler, J.....Vancouver.
Van Steenweyk, Miss..... "
Venables, E. P.....Vernon.
Wilmot, E. S..... "
Wilson, T.....Vancouver.

MANITOBA.

Criddell, Norman .....Aweme.
Dennis, A. J.....Miniota.
Heath, E. F.....Cartwright.
Wallis, J. B.....Winnipeg.

NOVA SCOTIA.

Hervey, C. L. G.....Round Hill.
Mackay, Dr. A. H.....Halifax.
Russell, John.....Digby.

SASKATCHEWAN.

Croker, A. J.....Redvers.
Willing, T. N.....Regina.

HONORARY MEMBERS.

Ashmead, Dr. W. H.....Washington, D.C.
Cockerell, Prof. T. D. A.....Boulder, Col.
Cresson, Ezra T.....Philadelphia Pa.
Edwards, William H.....Coalburgh, W. Va.
Howard, Dr. L. O.....Washington, D. C.
Scudder, Dr. S. H .....Cambridge, Mass.
Smith, Prof. J. B.....New Brunswick, N. J.
Uhler, P. R.....Baltimore, Md.
Webster, F. M.....Washington, D.C.
Wickham, Prof. H. F.....Iowa City, Iowa.

LIFE MEMBER.

Saunders, Dr. William.....Ottawa.
Director of the Experimental Farms of the Dominion.

ENTOMOLOGICAL SOCIETY OF ONTARIO.

ANNUAL MEETING.

The forty-fourth annual meeting of the Society was held in the Biological Building of the Ontario Agricultural College, Guelph, on Thursday, October 31st, and Friday November 1st. The chair was taken by the President, Dr. James Fletcher, Entomologist and Botanist of the Dominion Experimental Farms. Among those present were Rev. Dr. Fyles, Levis, P.Q.; Mr. Henry H. Lyman, Montreal; Mr. Arthur Gibson, Central Experimental Farm, and Mr. C. H. Young, Ottawa; Dr. Brodie, Dr. E. M. Walker, Mr. J. B. Williams and Mr. C. W. Nash, Toronto; Mr. J. F. Calvert, Orangeville; Professors Hutt, McCready and Bethune, Messrs. Jarvis, Eastham, Howitt, Zavitz, Crow, Klinck, and a number of students of the Ontario Agricultural College; Mr. Howes, Principal of the Consolidated School, Mr. Graesser and others, Guelph.

Letters expressing regret at their inability to be present were received from Mr. C. C. James, Deputy Minister of Agriculture for Ontario; Mr. W. H. Harrington, Ottawa; Mr. G. E. Fisher, Burlington; Prof. Dearness and Messrs. W. E. Saunders and J. A. Balkwill, London; Mr. J. Fred. Smith, San Jose Scale Inspector for Ontario; Mr. Walter James Brown, Editor of the *Weekly Globe and Canada Farmer*, Toronto; Mr. A. McNeill, Chief of the Fruit Division, Department of Agriculture, Ottawa; Mr. P. W. Hodgetts, Secretary of the Fruit Growers' Association, and others.

THE ENTOMOLOGICAL OUTLOOK.

[*The Annual Address of the President.*]

By Dr. James Fletcher, Dominion Entomologist, Ottawa.

Ladies and Gentlemen: It is with feelings of pleasure and pride that I welcome you and invite all present to take part in the Forty-fourth Annual Meeting of the Entomological Society of Ontario. During its long and useful life, this organization through its efficient officers, has made a constant and consistent endeavour to render its efforts not only useful to the Province in which it has held an official position as an intregal part of the Department of Agriculture, but also effective in advancing the scientific development of the science of entomology. Under the patronage and with the expressed sympathy and encouragement of the Minister of Agriculture and our highly esteemed Deputy Minister of Agriculture, our society has from the beginning until the present time continued to grow in usefulness and public appreciation among those for whom our efforts have been made. It is not now necessary to draw attention individually to the many stalwart men who have served on the councils, everyone of whom has been of great value to the society in adding to its stability, dignity, and usefulness; in building up its reference collections and magnificent library; in solving the various

problems which have arisen with the sudden appearance in destructive numbers of many injurious insect pests; and also in presenting to the public in its publications, the *Canadian Entomologist* and the Annual Reports, a vast amount of valuable knowledge, by which science has been enriched and enormous sums of money have been saved to Canada at a disaproportionately small expenditure. All of this has been done at the cost of much self sacrifice, but quietly and without ostentation. In this good work, this great work, there are, however, two names which I cannot refrain from mentioning, William Saunders and Charles J. S. Bethune. These two men to whom we owe so much, were associated together in founding the society, and from that time to the present day have been, with their energy, patience, discretion and unfailing courtesy, main stays of its progress and healthy growth. Without undue glorification, it is well that our members should recollect the long period over which this work of unbroken activity has extended; and it behoves us to see well to it that, as members of such a worthy society, our very best efforts are put forth in all the work we do, to take the fullest advantage of the greater facilities we enjoy to-day over those who have preceded us in our chosen field. Let us never forget the debt we owe to the pioneers of science. The results of the dearly bought experience of the past form a solid foundation of fact upon which we now stand firmly and confidently, to enter upon new fields of investigation. The status of entomological research to-day is far different from what it was even ten years ago. The number of devotees to these attractive studies is easily a hundredfold greater than then. The same may be said of almost every aspect of the case:—the available works of reference, the greater facilities and decreased cost of communicating with others, of local or distant travel, and, above all, the spirit of helpfulness to others less informed than themselves, so conspicuously exhibited by specialists in every branch of scientific study.

We in Canada can never over-estimate what we owe to the generosity and ever-ready assistance of the eminent fellow-workers in the great republic to the south of our borders, who have made America the chief fountain head and acknowledged centre of applied entomolgy. The names of such men as Riley, Walsh, Lintner, Howard, Comstock, Forbes, Webster, Smith, Marlatt, Felt and a host of others too numerous to mention, are known and honoured the whole world over, but nowhere more sincerely than in Canada, where we owe so much to them. As we all know, it is very seldom that an outbreak of any serious pest occurs in any part of the Dominion, but we can at once by consulting the writings of these men, learn all that is known of the habits of the insect and what the experience of many students has shown to be the best means of dealing with it. In entomolgy, at any rate, whether purely scientific or applied to the industries of the nation, there is no recognition of international boundary lines, unless perhaps it may be as an excuse for extending exceptional courtesies. Canadians are welcomed as freely at all the great conferences in the United States and have as full privileges of membership open to them as though they were freeborn citizens of the Union. At the recent organization of the Entomological Society of America, the most important entomological society in the world, two of the officers of this society were elected as original fellows and placed on the council, one of them being made a Vice-President. Since then two more members of our Council have been elected to fellowships, a highly coveted honour.

On the other hand, I need not remind you of the inspiring visits and addresses we have been favoured with at our recent annual meetings by Dr. Howard, Prof. Webster, Dr. Smith, Prof. Wickham, Dr. Skinner and our

honoured guest of the present meeting, Mr. A. H. Kirkland, who will explain to us the remarkable work which is being carried on under his superintendence against the Gypsy and Browntail moths in the State of Massachusetts.

It has long been a matter of surprise, even more than that, of amazement, to those who understand the enormous losses caused by insects to every class of vegetable products, that the study which deals with these powerful enemies and from which all remedies must emanate, should be so lightly esteemed by the general public. That this—may we call it, age of darkness and ignorance?—is now passing away, is evidenced by the important international investigations which are being carried on by Governments in all parts of the world at apparently enormous expenditure. I say "apparently," because the good results obtained so far outweigh in magnitude all the cost of securing them, that this latter must be considered trifling by comparison. One needs but to think of the immense saving which has been effected in checking or controlling some of the better known extensive invasions of insects. The prompt application of practical remedies could only be made where scientific investigations both of the life-histories and of the most appropriate remedies had already cleared the way and had pointed out what must be the road to success.

The large expenditures authorized by Governments from time to time for the purpose of investigating the habits of, and fighting against, injurious insects, have to some measure opened the eyes of the world to the important role played by insects as affecting the general welfare, and the necessity of dealing with them promptly and vigorously. Grasshopper invasions have in the past caused widespread devastation of fertile lands; but, with a knowledge of the egg-laying habits and with modified agricultural treatment of the land based on this knowledge, such losses can be to a large measure controlled. The San José Scale, although confined to only one comparatively small area in Ontario, and to two isolated points in British Columbia, has been the cause of considerable loss in the orchards of the Niagara Peninsula and also of much anxiety to Governments and fruit growers of the whole Dominion. From the vast amount of experimental work of many students here and in the United States, a practical remedy has been discovered in the lime-sulphur wash. The San José Scale has called for the voting of large sums of money in Canada and in almost every State of the Union; and, although, as stated, a practical remedy has now been found, it is probable that for all time fruit growers, in those districts where that insect thrives, will every year have to take steps to control it. This, however, it must be remembered, is not because the remedy is not all-sufficient, but, because, even against this well understood and justly dreaded enemy, so many fruit growers do not take the necessary steps or even ordinary precautions to control it. Perhaps the best known and most convincing instance of a large expenditure of this nature, is that for the campaign which has been waged against the Gypsy and Browntail moths in the State of Massachusetts. Up to the year 1900 a great deal of money had been spent against the former of these, and it had been almost vanquished, when, for political reasons, the appropriations were most unfortunately stopped. This was, it can now be seen, a most deplorable mistake; for during the following five years nothing was done, and the whole of the area previously infested was again overrun and fresh territory was invaded. The necessary appropriations up to the present time have now reached the sum of about two million dollars, and the Federal Government has had to step in and help. Although wonders have been achieved by Mr. Kirkland and his associates,

the end is by no means in sight. The thorough work done by Mr. Kirkland and Dr. Howard in connection with the introduction of parasites from Europe are an object lesson to the whole scientific world.

Dr. Howard, when speaking as president of the section of Economic Zoology, at the great international Congress of Zoologists held at Boston in August last, referred to this work in the New England States as being the most extensive campaign in economic entomology that the world has ever seen. He commended most highly the practical and efficient way in which it had been conducted, justly giving credit to Mr. Kirkland for his great executive ability and discretion in dealing successfully with a most difficult problem.

Another campaign calling for enormous sums of money and the greatest scientific skill, on the part of those engaged in the warfare, was made necessary by the spread of the Cotton Boll Weevil from Mexico into the United States. The extent of the damage done by this insect can hardly be believed by those who have not studied the matter; but in some seasons of great abundance the loss in a single year has been estimated at twenty-five millions of dollars, and it is said that the weevil is gradually spreading farther through the Southern States every year.

The Hessian Fly, the Wheat Midge, the Chinch Bug, and recently the Grain Aphis have all been the cause of great losses to the countries where they have occurred; but it is now generally recognized that, with these insects, as with nearly all others, farmers, fruit growers and gardeners can get from expert students of insect life useful information as to improved agricultural methods and as to tested remedies, by which much of the loss may be prevented. The publication of popular reports by provincial, state and federal governments has familiarized many with the appearance of their worst insect enemies; and the introduction of the so-called Nature Study into schools has taught a large number of the fathers and mothers of school boys and girls throughout the country, as well as the scholars themselves, that it is worth the while of every one to know something about the common insects which they see about them every day.

Characters which among others render insects particularly useful in Nature Study and in the higher exercises of animal biology, are, the large numbers of common species which are always accessible; their convenient size; the ease with which many kinds can be kept alive and reared in confinement to almost any required number, so that their habits can be studied under varying conditions; and the general similarity of a large number of specimens of a given species, and yet, at the same time, the wide range of certain features of variation within the limits of a single species. One of the greatest drawbacks to the use of insects, particularly in a school where there is no regular museum, is the perishable nature of specimens, if it should be desirable to preserve them. This, however, takes them out of the proper field of Nature Study, into natural history pure and simple, where provision must be made for the preservation of specimens so that they may be available whenever required for study and comparison.

The remarkable discoveries which signalized the close of the last century, as to the conveyance of many diseases through the medium of common insects, *e.g.*, malaria, yellow fever, typhoid, the bubonic plague and other diseases of mankind, and also of Texas fever and other diseases of domestic animals, have opened up another field of useful investigation which has inseparably linked together entomology and medical science.

During the past summer subsequent to our summer meeting, I had the privilege of travelling through our Northwestern Provinces with Dr. Henry

Skinner and listening to a series of lectures given by him upon the transmission of disease by insects. These lectures evoked the keenest interest from the large audiences who heard them, and there were many expressions of surprise at the intimate relation which was shown between the prevalence of some diseases and the occurrence of such common insects as house flies, fever mosquitoes, bed bugs, fleas, ticks, etc.

In this connection we, as Canadians, must read with great pride the accounts of the excellent work which is being done by Dr. Todd, of Victoria, B.C., and Dr. Allan Kinghorn, of Toronto, in connection with the School of Tropical Medicine, at Liverpool, England. The last named is now in Africa, on an expedition to the Zambesi, having been specially selected to investigate the fatal sleeping sickness and allied diseases, which are conveyed by insects. No less noteworthy are the investigations of animal diseases, which are being carried on by Drs. Higgins, Hadwen and Watson, under Dr. Rutherford, the Veterinary Inspector General of the Dominion.

From a consideration of the facts above cited I cannot but feel that the outlook for entomology and for entomologists is brighter than it has been for many years. The study of insects is now recognized as a useful branch of knowledge which affects materially the prosperity, comfort and health of mankind. This is attested by its introduction into the curricula of many colleges and schools and the appointment of Professors to instruct those who desire to learn about insects.

In Canada we have many good workers connected with our Society, or working alone, who are year by year adding to the mass of scientific knowledge concerning Canadian insects. This knowledge is increasing rapidly and is being placed on record for future use. Our society contains in its membership a large number of enthusiasts, and I am pleased to know that the publication of the annual Entomological Record in our reports has to some measure fulfilled its designed object, in encouraging and bringing into communication with each other and with specialists, many scattered workers in distant parts of Canada, who, by learning what others were doing, were enabled to be mutually helpful to each other.

As indisputable evidence of the value of this knowledge, it was pointed out by the Editor of the *Canadian Entomologist* in the issue for May last, that the Government of the United States, (of perhaps the most practical people in the world) passed appropriations for entomological purposes for the fiscal year ending June 30th, 1908, of upwards of $650,000, made up as follows:

For Bureau of Entomology, Washington.....	$136,000 00
Emergency appropriations:	
Cotton Boll Weevil investigations	190,000 00
Prevention of spread of Gypsy and Brown-tail Moths..	150,000 00
Eradication of Cattle Ticks	150,000 00
	$626,000 00

and, in addition to this, part of another appropriation of $250,000 for the National Museum is devoted to the care of the insect collections, in which work several officers are permanently employed. A proportion of another vote is used for the printing of bulletins, special reports, etc. These objects will certainly take at least another $24,000, making a gross amount of about $650,000, appropriated in a single year to study and fight insects.

Now, this large expenditure is only justifiable because it is believed that commensurate benefits are received in return. This brings me to the last

part of my subject, which I think is of keen personal interest to many present here to-day. If any of you, and doubtless there are some, think of making a serious study of entomology, that is to take it up as your life's work, there are several things which must be considered very carefully. The first, undoubtedly, is, Are you so keenly interested in the work as to enable you to excel? This is no easy matter. In the first stage of study, everything examined is strange, attractive and interesting; but then comes a long stage of close patient study and hard work, which love for the subject alone can carry you through. After this comes the reward in the shape of the delight of making new discoveries and learning more and more of the underlying principles of the science in all its branches, so that, when occasion arises, you may be able to take advantage of favourable opportunities for securing remunerative work. Moderate attainments are of little value in making a living. To be successful you must be, at any rate, just a little better than your fellows. Success must always depend on excellence; and, to attain this, thoughtful consideration and methodical application are as necessary as patience and hard work. All work undertaken should be done as well as possible, for your own sakes and for the work's sake. I believe it should be a principle with everybody never to strive for what is called "credit". Credit can never be gained by direct attack or by self-advertising. Fame which is the same thing, is a fickle godess who comes unsought and, if dragged in against her will, is in such a sulky mood that she is not worth having. Good thorough work will always demand and will always receive recognition. Strive to have your work as perfect in every detail and as conclusive as you can render it; and, above all things, aim to avoid the rocks and whirlpools of unproved theory.

Owing to the rapid development of economic entomology, new openings are being constantly created; and, as a consequence, there will be keen competition among the whole army of young men now training themselves to compete for these prizes. I know that there are openings to-day for well-grounded and mentally well-equipped entomologists. The demand for such men is increasing, and in the near future there will be further opportunities in many lines of work which to-day are not dreamed of. The best prepared will naturally gain the greatest prizes. The one desideratum is efficiency. A knowledge of insects alone is not sufficient to make an efficient practical entomologist. There are many necessary factors for such an official; for instance, he must be an enthusiast and should not only possess a general knowledge of all the different order of insects, but should have a special knowledge of some one or more; he should be well grounded in the elements of animal life and plant life and must have at least a working knowledge of the first principles of agriculture and horticulture, besides being fairly familiar with the botany of the locality where he does most of his work. A good knowledge of the English language is also most essential, so as to acquire a habit of expressing simply and clearly but in a succinct manner whatever information it may be necessary to communicate to the public.

Those of you who are in attendance at this well organized College, have special advantages of an exceptional nature, of which you should use every endeavour to avail yourselves to the fullest possible extent. You have Professors thoroughly qualified and eminent in their own subjects. In your Professor of Entomology especially, you have a man who perhaps has done more in Canada than anyone else to build up and establish on a firm basis the science which we have met here to-day to discuss, a man who, so capable in teaching, is also so genial and courteous that it is always a pleasure to meet him and a delight to be associated with him. You have around you extensive and beautiful grounds in which you can study insects and the

plants with which they are associated, as well as birds and other members of the animal kingdom. You have a comfortable, convenient and well equipped museum, and also the use of the extensive collections and valuable library of our Society. With such opportunities what should you not achieve? The College you are attending, is in many ways the very best of its kind in America or in the world. Think of this and remember it. It is an easy matter for the men gathered together under its shadow to honour their alma mater. May it be always their highest ambition to honour her and to be an honour to her.

CONFERENCE ON FRUIT-TREE INSECTS.

The main pests discussed were the Fruit-tree Bark Beetle or Shot-hole Borer, the Codling-worm, the Oyster-shell Scale and the Woolly Aphis.

Mr. L. Caesar, of the Ontario Agricultural College, opened the discussion on the first named insect by relating some observations he had made on its ravages in the Niagara district. His account was as follows:

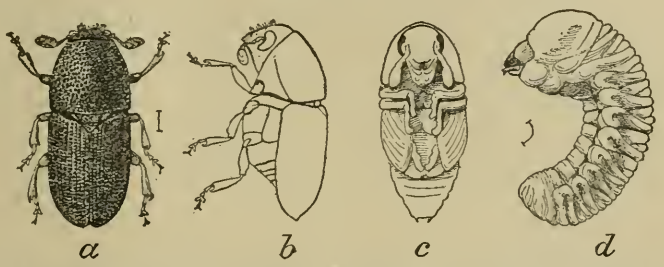

Fig. 1.—*Scolytus rugulosus:* *a*, adult beetle; *b*, same in profile; *c*, pupa; *d*, larva—all magnified about 10 times. (U. S. Dep't. of Agriculture).

Fig. 2.—Work of *Scolytus rugulosus* in twig of apple—natural size. (U. S. Dep't. of Agriculture).

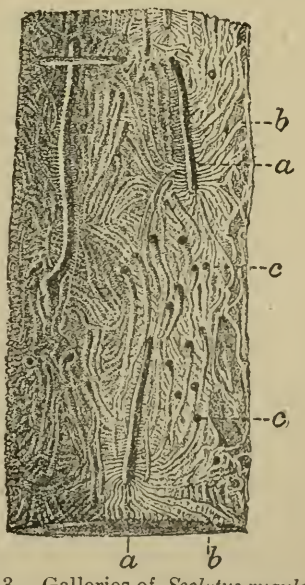

Fig. 3.—Galleries of *Scolytus rugulosus* on twig under bark; *a*, *a*, main galleries; *b*, *b*, side or larval galleries; *c*, *c*, pupal cells—natural size—(after Ratzeburg, from U. S. Dep't. of Agriculture).

The Fruit Tree Bark Beetle (*Scolytus rugulosus*).

In August last (1907), while acting as assistant entomologist in the temporary absence of Dr. Bethune and Mr. Jarvis, I received a letter from Mr. Geo. Olmstead, of Grimsby, asking whether I knew of a blight that attacked cherry trees. In response to a request for samples of the affected leaves and twigs, Mr. Olmstead sent me as many as he could put in a large envelope. These were examined for fungus diseases and some were also sent to the Bacteriological Department to be tested for bacteria. No fungus or bacteria were discovered to be present. Accordingly I wrote to Mr. Olmstead and told him that I should be making a tour of the Niagara district in a few weeks to investigate the results of the lime-sulphur wash, and would call and try to discover what was the cause of the injury to his cherry trees.

On September 23rd, I went to Fruitland and in the course of my regular investigations visited many prominent fruit-growers. I asked each of these whether any of their cherry trees had shown any signs of disease. Most of them said that they had observed the leaves of some at least of their trees withering up and dying, but did not know why. On investigation we found that the trees that had been healthy last year and the early part of this year, but that were now dying, were thickly dotted in most cases with gummy exudations, varying from the size of a pea to half an inch or more in diameter. On removing the gum from a number of these places we found clear evidence that some insect had bored a tiny hole through the bark in each case and that it was from these wounds that the gum had exuded. On further investigation we found a number of the insects themselves. These I identified as Fruit-tree Bark-beetles (*Scolytus rugulosus*), Fig. 1. They were about one-tenth of an inch in length, and about one-third that amount in width, were nearly cylindrical in shape and black in color.

A number of orchards were visited in the following localities: Fruitland, Winona, Grimsby, Jordan, Vineland, and St. Catharines. In nearly all of these the beetles were found attacking not only dead and diseased trees, but also trees that had been perfectly healthy hitherto. In some orchards nearly half of the cherry trees were severely attacked, in others only a very few trees.

The attacks were not confined to any one variety of cherry tree, for both sweet and sour varieties were assailed. In one orchard, however, where Montmorency and Richmond trees were side by side, the Richmonds were much injured while the Montmorencies were left untouched

The only other tree besides the cherry on which I found the beetles were a few plum trees in the St. Catharine's district. Two of these especially were very badly covered with gum and were practically past recovery.

On examination of the habits of the beetle, it was found that they seemed in most cases to have attacked the dead or weak trees first and to have spread from these to the healthy ones. This, I find, is in accordance with the regular accounts given by different writers on the subject. In their attack upon healthy trees the beetles did not confine themselves to any set order of procedure but apparently were just as likely to assail twigs or small branches as the trunk.

On the trees where the gummy exudations were, I examined a number of the holes from which the gum had exuded, expecting to find larvæ present, but in no case did I find any. It looked as if the attacks were made with the intention of causing the tree to die and thus become a proper place for egg laying. Larvæ, however, were found in considerable numbers under the bark of dead trees. The surface of the wood in such cases, when the bark had been

removed, was engraved with numerous little channels running in different directions but not going deep into the sap-wood. (Figs. 2 and 3). It was in these channels that the larvæ (small, legless, white grubs) were found (Fig. 1 *d*), often more or less concealed by the sawdust-like castings. The holes leading through the bark of such trees into the wood were small and such as would be made by fine shot (Fig. 2); hence the beetle is often called the "Shot-hole Borer." This sort of hole on dead or almost sapless trees and the gummy exudations on healthy trees make the presence of the beetle in an orchard easy to discover. That the insects were still at work late in September was evident from the number of adults discovered and the fresh castings at some of the holes. In one of these holes I found eggs but whether laid by a beetle or some other insect I could not say. I find, however, that some writers state that the winter is passed both in the egg and larval stages. I have not been able to find a reliable account of the life-history of the insect, but it looks very much as if there were more than one brood in a season. I should have mentioned earlier that the first evidence that the cherry tree leaves were beginning to die was about August 1st.

When asked by the fruit-growers what could be done to check the beetles, I told them that the plan ordinarily recommended was to cut down all dead, dying, and badly infested trees and burn them. I said that I believed that spraying was also resorted to as a preventive, but that having had no experience with fighting this insect myself, I should bring the question up at the Annual Meeting of the Entomological Society and endeavor to discover the best method to be pursued in fighting it, and would then send full particulars to the newspapers of the different districts.

Dr. Fyles: Is it possible for such a small insect to do so much injury?

Dr. Fletcher: Yes, quite possible. We should like to know the life history of the beetle better to be able to give more definite methods of treatment. The first thing to do, however, is to cut out and burn all dead and dying trees and branches. No branches pruned from any kind of tree should be left in brush heaps to become a breeding centre. Any wash applied must necessarily be in the form of a deterrent on account of most of the insect's life being passed under the bark. Carbolic washes have given satisfaction in some places; they are applied in spring.

Mr. Caesar: The State Entomologist of Georgia thinks that lime-sulphur carefully applied in late spring should be equally good.

Dr. Fletcher: Possibly. It looks as if lime-sulphur were being considered a panacea for all ills. It is helpful in so many things that we may be expecting it to do everything for us.

Mr. Jarvis: A few of the Fruit-tree Bark-Beetles are to be found in nearly every district each year on dead fruit-trees, such as cherry or plum. Some healthy apple-trees near here which are badly infested with the Oyster-Shell Scale have been attacked.

Dr. Fletcher: It is important to know that Mr. Caesar's observations go to show that healthy trees may be attacked. It used to be thought that it was only diseased or dead trees that were infested. It is from the latter kind of trees that the beetles spread to the healthy ones. According to Webster this Scolytus follows bad attacks of the San Jose Scale; it has been very abundant at Leamington where the scale is common.

The Codling-Worm.

Mr. Caesar: I cannot help feeling particularly interested in this question of the Codling-worm. I saw its ravages in the apple orchards of the Niagara district last year and again this fall. I believe that the damage

done this year is even greater than that of last year. I visited a good many apple orchards from Fruitland to St. Catharines and I believe that fully 50 per cent. of the apples were rendered unmarketable by worms. Strange to say, comparatively few pears were injured, not more, I think, than 5 to 10 per cent. where the trees had been sprayed with poisoned Bordeaux mixture. The damage to apples, however, was most discouraging. I cannot help feeling that the farmers do not know how to deal with the pest. Some of them use poisoned Bordeaux and bandage their trees as well and yet have simply hosts of Codling-worms. It may, of course, be that the spraying is not done at the right time and that the bandages are either not properly put on, or not opened and the worms taken out so frequently and thoroughly as is necessary. Something will have to be done or else farmers will give up apple growing in that district. I know one man who will have from 8,000 to 10,000 barrels of apples this fall, but of these fully 4,000 barrels will be unfit to put on the market, simply on account of the Codling-worm.

Prof. HUTT: The Codling-worm has certainly been very bad this season in the Niagara district and the remedies applied are not sufficient. The fruit-growers do not seem to know how to fight the pest.

Mr. JARVIS: I do not think many of the farmers bandage their trees, and some who do fail to remove the bandages once every ten days as they should.

Dr. FLETCHER: Great care should be taken to see that all the worms under the bandage are destroyed each time.

Mr. CAESAR: This is greatly facilitated by the trees being scraped in the winter.

Dr. BETHUNE: Do the farmers gather up the fallen apples each day and destroy them, or sell them to cider factories?

Mr. CAESAR: There are many orchards where the fallen apples are not gathered; in fact I think that in none of the orchards is this done daily.

Dr. BETHUNE: Could they not in some cases let their hogs or sheep run in the orchards?

Mr. CAESAR: Most of the orchards are not fenced, and very few hogs or sheep are reared.

Dr. FLETCHER: If the fruit-growers will spray with poisoned Bordeaux at the proper times and will put bandages on when the worms are beginning to emerge from apples, and remove these at least every tenth day and destroy the worms underneath, they will control the Codling-worm. At Ottawa we have had no Codling-worms in our orchard on the Experimental Farm for ten years because regular spraying has been done; and even in districts where there are two broods similar good results can be obtained.

Mr. CAESAR: Do all the worms that fall to the ground in the apples, or otherwise, find their way up under the bands? Do not a large number hide under lumps of earth or any kind of refuse or shelter on the ground?

Dr. FLETCHER: Many of course will get under the bark below the bandage, unless it has been scraped; some will hide under loose bark around the base of the tree or under boards, but I do not think any pupate under lumps of earth or among grass, at least I have never found any.

Apple growing in the Niagara district is not considered so remunerative by the fruit-growers there as the raising of peaches and other kinds of fruit, so that there has been a great deal of neglect of apple orchards, with the natural result that every opportunity has been given to the Codling-worm to increase at a very rapid rate, and even where one farmer looks after his orchard well, the neglect to do this on the part of his neighbor prevents satisfactory results being obtained.

Mr. Jarvis: I should like to call the attention of the members to the fact that the O. A. College orchard has been carefully sprayed this year at the proper time in the spring, and twice later on in the season at the usual intervals, and very few, not more than 5 per cent. of the apples are wormy. We have not a full second brood here but have about 15 per cent. of a second brood in ordinary years. A few trees on the campus that were not sprayed had almost every apple wormy. One could scarcely want clearer evidence of the value of spraying.

The Oyster-Shell Scale or Apple-tree Bark Louse.

Prof. Hutt was asked by the chairman to open the discussion on this subject. He related his observations in different parts of the province and stated that last year had been a very favorable one for the increase and spread of this scale, and that this year he had heard many reports of its great abundance, especially in the counties of Northumberland and Ontario. He thought it was doing a great deal of injury to fruit trees, especially apple trees all over the province

A Member: Are many other kinds of trees attacked by this scale besides apple trees?

Mr. Jarvis: We have found it at Guelph on apple, pear, plum and cherry trees; on currant, gooseberry, rose, spireas and lilac, and also on numerous forest and shade trees, such as mountain ash, hawthorn, red-osier, dogwood, basswood, both black and white ash, American aspen, horse-chestnut and mulberry trees.

Mr. Caesar: I think that from what I have seen this year there will not be half the number of Oyster-shell scales next year that there were last. The scale-lice hatched out all right this June and the branches of many trees were almost covered with the young. I examined some of these same trees a few weeks ago and found that the great majority of the young scales had not lived through the season, but had died when only a few weeks old.

Dr. Bethune: Some experiments that have been made with lime-sulphur wash seemed to show that it is not entirely satisfactory as a remedy for this scale, though it destroys a large number of them.

Dr. Fletcher: It is not usually considered a perfect remedy for Oyster-shell scale.

Mr. Crow: I sprayed a few trees here with the ordinary kerosene emulsion, and some others with the flour-kerosene mixture. The spraying was done just when the young had hatched out and were moving over the branches. The results were very satisfactory. I can bear out the statements made as to the prevalence of this scale throughout the province and the vast injury it is doing, but I agree with Mr. Caesar that from some cause, whether it be the late spring and cold weather after the young emerged, or whether it was owing to rains at that time, there seems to have been a very great diminution in the number of living scales this fall.

Mr. Nash: My experience makes me agree with what has been said in regard to the decrease this year in the number of scales. This spring I noticed one of my trees late in June swarming with young scales. I examined the same tree not long ago and was amazed to find scarcely a living scale on it.

Dr. Fletcher: This is not the case in all parts of the province. I was interested in Mr. Crow's remarks about the success of the kerosene emulsion and flour-kerosene sprays. These may be considered the standard remedies against the Oyster-shell scale.

Mr. Caesar: The orchards in the Niagara district, that two years ago were badly infested with Oyster-shell scale and were sprayed last year and again this year with lime-sulphur, seem to be quite clear of this scale.

Dr. Fletcher: Wherever an orchard is sprayed year after year with lime-sulphur or even with Bordeaux mixture, the Oyster-shell scale gradually ceases to trouble. I have always found, moreover, that the healthier you can make your trees, the less likely are they to be badly attacked by Oyster-shell scale. Lime-sulphur helps the tree to be healthy.

Mr. Caesar: I found that in some orchards almost 50 per cent. of the scales were parasitized by a tiny yellowish four-winged fly (a Chalcid). Mr. Jarvis and I raised a number of these parasites this spring.

Dr. Fletcher: I have seen a case where 80 per cent. were parasitized, but I am sorry to say that the parasite does not work in all parts of the province, as it is only locally abundant.

Mr. Crow: Mr. Dempsey, of Trenton, thinks the parasite has controlled the scale in his orchard.

Mr. Jarvis: A fungus is also attacking the scale. It is of a pinkish orange color, and probably is the same one that attacks San Jose scale. I found it on some specimens of Oyster-shell scale sent to me recently. It is also found at Guelph.

Dr. Fletcher: That is very interesting. I have found this fungus in one or two places but not in Ontario. If you possibly can you ought to try to spread the fungus, Mr. Jarvis. Try inoculating oyster-shell scale and San Jose with it in different orchards. Valuable results might possibly be obtained, at any rate it is wise to try it.

Mr. Jarvis: We have also found a tiny little mite that destroys the eggs. I have seen the statement made that it does not destroy them, but my experience, I think, justifies what I have said. The eggs where these mites were found in the spring were nearly all destroyed, or in some cases were brown in color and clearly never could hatch. In our class work, when examining the scales under the microscope, we have found a large number of scales with these mites in them.

Dr. Fletcher: We have then three friends to help us in fighting this scale, namely, the four-winged chalcid fly, the mite, and the fungus.

The Terrapin Scale.

A very brief discussion of this much talked of scale (*Eulecanium nigrofasciatum*) took place:

Dr. Fletcher: Have any of you had definite information that a satisfactory remedy for the Terrapin scale has been discovered?

Mr. Jarvis: I have not seen the results of any work on the scale further than the statement that lime-sulphur would not kill it.

No one else had any experience with remedies to relate, so Dr. Fletcher said that he had been informed, or had seen a statement that kerosene emulsion utterly failed to kill the insect.

Dr. Bethune: The scale has only been reported from three places in Ontario, viz., Walkerville, Windsor and St. Catharines. It does not seem to be spreading. Only maple trees were attacked.

Dr. Fletcher: What remedy did you recommend?

Dr. Bethune: I recommended that the trees shoud be cut down and burned, which was accordingly done.

The Woolly Aphis.

Prof. Hutt brought up the subject by remarking that the Woolly Aphis was very abundant this year in some districts.

Mr. Jarvis: I should think it was. In the orchards around here nearly every young tree has every little crevice or wound on the bark filled with them.

Mr. Crow: I have noticed that they are very bad in the College orchard, but I do not think they have injured the trees much.

Dr. Fletcher: When did you notice that they were numerous? Was it in summer or autumn?

Mr. Jarvis: In autumn.

Dr. Fletcher: Has anyone ever found the Woolly Aphis in the root form in Canada? Personally I never have, though it is found in the United States and does much injury there.

Mr. Frier: When we were taking up some young conifers in the Forestry Department this year, we found a great number of Woolly Aphids among the roots. Would these be the kind you refer to?

Dr. Fletcher: No, these are a different species. "Woolly aphids" are found on many kinds of trees and there are many different species.

Prof. Hutt: It is very interesting to see the chickadees eating these insects. They seem to devour them with great relish, and soon destroy a great number of them.

Bees and the Yield of Fruit.

Prof. Hutt: I should like to call the attention of members to the lack of bees for fertilization this year. I am told that in many districts nearly 80 per cent. of the bees perished during the winter or early spring. Added to this the fact that during the blossoming season we only had a few really good days for the bees to work. I believe it was owing to this that so small an amount of fruit set this year, smaller than usual. I firmly believe that fruit-growers should keep more bees. I notice that men who keep bees have a better set of fruit. Mr. Dempsey, of Trenton, is a good example of these men. He has bees and never fails to get a good set of fruit.

Dr. Fletcher: I am glad you brought this subject up. Mr. Macoun, of the Experimental Farm at Ottawa, called my attention to the splendid crop of apples we had this season, whereas the apple crop for miles around Ottawa was almost a failure. The only explanation I can find is that we had bees to help us and other people had not.

Prof. Hutt: Do wild bees assist to any extent in the fertilization of fruit blossoms?

Dr. Fletcher: Certainly, but not to the same extent individually as the honey bee. The latter seems to be especially built for this purpose. He seems to delight in getting covered all over with pollen and conveying it from one blossom to another.

Dr. Brodie: Many families of wild bees do a great and excellent work in fertilization; especially is this true of the great family Andrenidæ, of which there are about 100 species; the Syrphidæ and Halictus, also, do good work in fertilizing fruit blossoms.

San José Scale.

A short discussion on this scale was brought about by the reading of the following letter from Mr. J. Fred. Smith, San José Scale Inspector for Ontario:

"One of the most noticeable things in connection with the San José scale this year was the lateness of the commencement of the breeding season; and owing to the lateness of the spring in opening large numbers of them starved to death. Another peculiarity therewith was that this was most noticeable on heavy cold soils. On the warmer and earlier soils they have done fairly well. In other words in all those sections where early gardening is done and where vegetation started early the sap also began to flow earlier, and as this is their food they were consequently started in their work of destruction in good shape.

"I am also pleased to inform you that never before was there so much treating done for its destruction. Lime and sulphur was the almost universal remedy and so much sulphur was used that there was a sulphur famine. At Leamington, towards the last of the season, none could be got at all. In village and small town lots considerable Target Brand and Carlson's Mixture was used, but on account of the large quantity of scale that were winter killed it was almost impossible to form an opinion as to their value. At Leamington I made an inspection, along with the local Inspector, of several lots treated with Target Brand, and as I was not then aware of the large quantities winter killed I had to give the Brand credit for doing the good work; but later I found some lots that had not been treated at all and there was very little life to be found. The examination at Leamington was made on the 5th of July. On the 30th of July, at Bartonville, on trees which had not been treated for the scale larvæ were to be found running, which is the latest that I have ever seen in Ontario."

Miscellaneous.

The remainder of the time set apart for the conference was employed in discussing a variety of insects, respecting which information was desired. For the potato flea-beetle it was stated that Bordeaux mixture had proved to be the best remedy, and also for that attacking cucumbers; poisoned-lime is useful for the grape-vine flea-beetle and is made with Paris green and lime so thick that it can only just be sprayed. For the oyster-shell scale the lime wash (made in proportion of one pound of lime to a gallon of water) has proved entirely satisfactory. It should be applied in the autumn as soon as the leaves have fallen, and be repeated a few days later. Two applications of this thin wash are more effective than a single one made with double the amount of lime. For slugs attacking celery, freshly slaked lime was recommended, to be put on before hilling up the plants, and repeated for two or three days in succession. The lime sticks to the slimy bodies of the slugs and kills them through its caustic effects.

Mr. W. R. Thompson mentioned that millipedes attacked tomatoes in large numbers at Ste. Anne de Bellevue this summer, especially injuring any fruit that touched the ground. The chairman advised as a remedy a dressing of nitrate of soda.

REPORTS ON INSECTS OF THE YEAR.

Division No. 1,—Ottawa District. By C. H. Young, Ottawa.

During the past season I regret to say I have been unable to devote as much time as I should have liked to the study of the insects of the Ottawa district, which have appeared in destructive numbers.

The following notes, however, are submitted:

The small White Cabbage butterfly (*Pontia rapæ*), was very plentiful in the district and its ravages in neglected gardens could be easily seen. It was particularly troublesome towards the end of August. On August 22nd I visited a large garden at Billing's Bridge, near Ottawa, and here the injury was to cauliflowers. The insect-powder remedy is such a simple one that I cannot understand why growers of cabbages and other plants which are attacked, allow this insect to destroy their crops.

The Colorado Potato beetle (*Leptinotarsa decemlincata*) was particularly abundant in many potato patches. Although the season was a poor one for potatoes, those growers who sprayed with the poisoned Bordeaux mixture were well rewarded.

Grasshoppers were very numerous at Meach's Lake, Que., near Ottawa. In one garden of a friend of mine all the flowering plants were completely destroyed, while in another large garden about half a mile away flowering plants were saved by allowing chickens to run in the garden. This is another instance of the value of poultry in reducing the numbers of injurious insects.

When these domestic animals once acquire the habit of feeding on grasshoppers and cutworms, they become of so much more value to the owner. At Billing's Bridge grasshoppers were also noticed injuring cauliflowers and other crops of vegetables.

The Fall Webworm and the Yellow-necked Apple-tree caterpillar appeared in considerable numbers and their injuries were very apparent throughout the district. Where these insects were troublesome on shade or ornamental trees, the simple remedy of cutting off the infested branches was resorted to. Halisidota caterpillars of two species, the Hickory Halisidota (*Halisidota caryæ*) and the Spotted Halisdota (*H. maculata*) were responsible for much injury to the foliage of many trees and other plants in late August and early September. At Rockliffe Park, near Ottawa, the caterpillars of the Spotted Halisidota were abundant on willows, basswood and Wild Rose.

Several colonies of the Black Walnut worm (*Datana integerrima*) were observed as very destructive to cultivated Black Walnuts and Hickories. This insect, however, cannot be usually considered an injurious one at Ottawa as it does not occur in sufficient numbers to do serious damage. Cutworms, while troublesome in some gardens, were not responsible for very much damage, as far as I know, in the district, during the past season. The poisoned bran remedy is becoming more widely used every year.

Root Maggots, too, were not in such numbers as to cause much anxiety to market gardeners during the season of 1907.

Division No. 2.—Midland District. By C. E. Grant, Orillia.

The year of 1907 was a remarkably backward season; on the 27th of May I walked home in half an inch of snow and the wind blowing a blizzard, then a short three months of summer which was excessively dry.

No very serious complaints of insects were reported to me.

There were, however, widespread complaints of the Buffalo-beetle, which has apparently invaded most houses and no efficient remedy seems to have been found or else the remedy is not properly applied.

The currant saw fly and the codling moth were also very bad this year and the apples here (in fact most fruits) were small, therefore the crop was poor. The cutworms were also rather plentiful.

Though perhaps not doing much damage, the Walking-sticks were to be met with very often and lots of people brought them to me, who before would have been ready to swear that there was no such insect in existence.

Grasshoppers were very plentiful late in the season and devoured a lot of the leaves which were left after the drouth.

Late in September immense numbers of the Buprestid (*Chrysobothris femorata*) were running over the cement walk of the main street and were crushed by pedestrians. I tried to trace the source of the supply but could not.

The Fall Web-worm was very much in evidence. I also noticed the remarkable number of Halisidota and Acronycta or Apatela caterpillars; they were all over the fences and until quite late in October. I took two specimens of Telea polyphemus in August, quite an unusual occurrence.

I have only added one new moth to my locals this years, viz., *Plagodis keutzinzii*.

Division No. 3.—Toronto District. By J. B. Williams, Toronto.

The Tussock Moth still continues to do a good deal of damage to the shade trees in Toronto, though they have not been quite so numerous this summer, as far as I have observed, as they were a year ago. The comparatively cool weather may have acted to some extent as a check upon their numbers, or possibly parasities are beginning to get the upperhand, and we may see their gradual diminution by natural causes, during the next few years. They have certainly appeared for some time past to be having everything their own way.

The Tent caterpillars have been numerous round Toronto, and I saw a good many of them in the country round Lake Simcoe.

The Codling Moth has been very destructive to many apple trees in the city gardens. In the same orchard some trees have hardly been touched by them, while others have had almost every apple more or less injured by the ravages of this injurious pest.

Though the Walking-Stick insects were very numerous last year at Niagara Glen and swarms of them had stripped several large trees of their foliage, I failed, this year, to find a *single specimen* on two or three occasions when I visited the place. What can have been the cause of their sudden disappearance?

Division No. 4.—East York District. By C. W. Nash, Toronto.

The past season seems to have been an unfavorable one for the development of most forms of insect life. Butterflies were particularly scarce, even the common species which usually swarm about the garden and over fields of blossoming clover, being conspicuous by their absence. I did not see one Monarch Butterfly (*Anosia archippus*) until the first week in August, after which a few were noticed every day, but so far as I could observe, there was no congregation prior to migration, and no regular flight in September such as usually takes place along the shore of Lake Ontario from east to west, when the insects are on their journey to the south. On the other hand many were here later than usual; a few having remained until October, 5th, when the last were seen.

Cosmopepla carnifex.—During the past few years this beautiful little hemiptera has been gradually increasing in numbers until in June, 1907, it became enormously abundant on Aquilegia, Antirrhinum and Pentstemon

in gardens. On the 25th of June all the plants of these genera in this neighborhood were covered with the insects and a vast number of eggs had been deposited upon the main and flowering stems of the plants. I was curious to know what would happen when all the eggs were hatched for it seemed as if they would produce enough insects to over-run the country. Apparently the season was unsuitable for the development of the nymphs or one of the many disasters to which "feeble folk" are subject overtook them, for by August there were no Cosmopeplas to be seen. The millions of adults which appeared in the spring had all passed away and there were none of their progeny to represent them.

I have not yet been able to discover what this insect feeds upon. As it resorts to Aquilegia, Antirrhinum and Pentstemon and upon them its eggs are deposited, it would seem that these plants should supply its food. Yet although hundreds of adult and immature Cosmopeplas may be upon a plant, no perceptible harm is ever done to it, and all my efforts to raise the nymph from the eggs have proved abortive, though I kept them well supplied with shoots from the plants upon which the eggs were deposited. I tried them also with Aphides under the impression that perhaps they lived upon the juices of other insects, but this too was a failure.

Locusts.—Just before harvest time locusts became troublesome in the oat fields, where they did some damage by cutting off the ripening grain from the stalk and dropping it to the ground. In some fields the soil was covered with the grain so cut off. Under ordinary circumstances the loss would be somewhat serious, but this year, owing to the short crop, is doubly so.

The Stalk-borer (*Gortyna cataphracta*).—Perhaps the worst enemy vegetables growers and florists have to contend with now is the larva known as the Stalk-borer. This creature has increased rapidly in numbers during the past five years and unless it is checked by some of its natural enemies will cause great loss and annoyance, as it is almost impossible for man to control it by any mechanical means. During this past season I took over two dozen larvæ from the stems of plants in my garden of about a quarter of an acre and I received great numbers from market gardeners and florists both amateur and professional of this district. It is practically an omnivorous feeder, any plant, either wild or cultivated, having a stem large enough to contain it being liable to attack and unfortunately the infested plant shows no sign of infestation until the larva has eaten out the heart of the occupied stem. When this occurs the stem breaks off or its leaves wither and die. If it is the main stem which is occupied, as is generally the case with tomatoes and corn, the plant is ruined.

I have not yet been able to ascertain where or when the moth deposits the eggs from which the larvæ are produced. It might be that the moth hibernates and deposits its eggs upon the shoots of plants in the spring, but I have not yet found an adult dormant, nor have I seen it in the spring.

In July the work of the larvæ is first noticeable, and a rather peculiar thing is that, almost up to the end of the month, larvæ varying in size from about one-third to full grown may be found in close proximity; this year I found on the fourteenth of July a number showing among them even greater variations than that.

About the twenty-fifth of July the more advanced specimens begin to enter the pupal stage, the smaller ones continuing to feed sometimes well on into August. Early in September the moths begin to emerge and continue doing so until the end of the month when they are at the height of their abundance, and on dark nights come to light in large numbers. This year

they were rather later than usual and I did not see as many moths flying as in 1905 and 1906. In the latter year they were very abundant at light on the night of September 26th, which was dark and rainy.

Although I have bred a great many of these insects from the larval state to maturity, I have never found one parasitized and their method of life, no doubt, protects them largely from enemies of this class.

The Tarnished plant bug, though still more in evidence than was pleasant, did less mischief than usual, and Aphides, though rather abundant in spring, became less so as the season advanced. Dragon-flies were very scarce indeed, so much so that in the marshy meadows where they usually abound I did not see this summer, one for every hundred generally to be found in these localities. Bumble -bees also were far less numerous than they should be for the good of the country. Of the five or six nests provided by me for them, not one was occupied, though for the previous five years every one has been tenanted.

Division No. 6.—London District. By J. A. Balkwill.

In this neighborhood we have been fortunately, almost exempt from serious injury from insects with one noteworthy exception that was an unusually large number of cutworms which attacked almost every kind of garden vegetable even boring into onion stalks; one party tells of taking 30 off one tomato plant; the larvæ were nearly full grown and soon went into pupation.

The Cottony Maple scale which disfigured our maple trees for a number of years has almost entirely disappeared.

The Tussock moth we have in considerable numbers but not numerous enough to cause alarm.

Nothing is heard about the Pea Weevil although an occasional one is found in the peas which were sown early.

After these reports were read, a short discussion followed, in the course of which Prof. Hutt said that the Rose Chafer was very injurious near Leamington this year. The English Sparrow had developed a taste for them and devoured great numbers. This is one point to be scored in favor of these birds. Mr. Cæsar said that he had been sent some specimens of insects from Toronto which were reported to be destroying almost everything in a garden. They proved to belong to the Fulgoridæ and were identified by Dr. Bethune as *Ormenis pruinosa*, Say. They seemed to be fairly numerous about Toronto and were found on tree trunks when he visited the city about the middle of July.

EVENING SESSION.

Thursday, October 31st, 1907.

In the evening Mr. A. H. Kirkland, of Boston, who is in charge of the efforts now being made in Massachusetts to suppress the Gypsy and Brown-tail Moths, gave a highly interesting account of the work and the results that have so far been accomplished. His address was illustrated with a series of lantern pictures which graphically showed how the operations are carried on. He described also the importation of parasites and some pre-

daceous beetles from Europe, and the amount of success which had so far attended their efforts to breed them. Dr. Fyles followed with one of his charming papers "The Voices of the Night." Much regret was expressed that the attendance was small owing to the attractions of the holiday, it being Thanksgiving Day and Hallowe'en

THE GYPSY AND BROWN-TAIL MOTHS IN MASSACHUSETTS.

Abstract of Address by A. H. Kirkland, Supt. of Gypsy Moth Work, Boston, Mass.

After congratulating his audience upon the evidences of agricultural prosperity shown in the parts of the province through which he had passed, and speaking of the serious loss to agriculture often inflicted by injurious insects, Mr. Kirkland took up the matter of imported insect pests, and explained why they were so much more injurious to crops and trees than native insects.

"In a state of nature, every insect has its enemies, such as birds, diseases, and, most important, insect parasites. When an insect pest is transported thousands of miles to another country, and is thus freed from its natural enemies, it multiplies remarkably, and causes much greater damage than when in its native environment, simply because it is relieved from those checks which nature has provided for it. Thus the San José scale is much more injurious in this country than in its native home in Northern China. The Elm-leaf Beetle and the Gypsy and Brown-Tail Moths also give striking illustrations of this fact. These two moth pests have caused most serious havoc in eastern New England, have spread rapidly, and one, at least, the Brown-tail Moth, occurs in the Maritime Provinces of Canada."

The speaker then described the importation of the Gypsy-moth to Medford, Mass., by Professor Leopold Trouvelot in 1868, its accidental escape from his care, and its slow but constant spread throughout the neighboring towns. "Recognizing the importance of the catastrophe, Professor Trouvelot promptly gave notice to Doctor C. V. Riley, then State Entomologist of Missouri, and also to Doctor Hagen, at Harvard University. Unfortunately, no great importance was attached to the matter, although at this time $1,000 would have cut and burned over the many acres of brush land in the vicinity of Profesor Trouvelot's home and wiped out the incipient moth colony. The moth increased unrestrictedly for some twenty years, but in 1888 the public of Medford and vicinity suddenly woke up to the fact that they had a serious caterpillar plague on their hands, and at once made vigorous efforts to combat it. One year's experience was sufficient to show them that individual effort could not control this formidable pest, and the aid of the cities and towns was invoked. Another year convinced the cities and towns in turn that they could not fight the insect unaided, and the State of Massachusetts was asked for help. The work in Massachusetts began in 1890 and was continued until February 1, 1900, principally under the auspices of the Massachusetts Board of Agriculture. This work suffered in certain critical years from lack of sufficient appropriations, or from appropriations not made in season for most effective action. At the same time, great progress was made in bringing the insect under control, until in 1900 but few moths could be found anywhere in the infested region. The insect had been thoroughly suppressed

by the application of hand methods, so-called, many of which were invented to meet the needs of the work. In 1899 not over ten acres of woodland were stripped in the entire infested district, which embraced some 350 square miles. In 1900, although it was pointed out to the Massachusetts Legislature, that scattering moths remained here and there in the district, that body, in its wisdom, saw fit to discontinue the work, partly from political reasons, in spite of the protests of entomologists who thoroughly realized the gravity of the situation, because of the prolificacy of the moth. During this campaign about $1,250,000 was expended, and the moth had been brought thoroughly under control. The insect at once began to increase steadily, yet nothing more was done in the warfare against the moth pest until 1905, when the caterpillar plague had again become such a nuisance that the work was resumed under a co-operative plan whereby the citizens directly bear part of the expense of supressing the insect, cities and towns another part, and the State the major part. In other words, the present scheme of work involves a direct co-operation of property owners, cities and towns and the State, under the general direction of the central office, thus insuring uniformity of action. Under this scheme of work, upward of $750,000 was expended during 1906, and as much will be laid out the present year.

"The principal means by which the Gypsy moth is spread over its present area of some 2,800 square miles, is through caterpillars spinning down from the trees and dropping on automobiles, teams, cars, etc. Fortunately, the female moth does not fly but the insect spreads rapidly in the manner mentioned. A volume might easily be written on the means by which the Gypsy moth is spread. The young caterpillars spin down by thousands from neglected, infested trees in May and June. Where such trees overhang highways, every milkman, every grocer, every garbage man, in short, every vehicle gathers them and carries them to a greater or less distance, thus founding innumerable new colonies. In the badly infested district regular daily traffic of the classes mentioned above is most dangerous. Long distance scattering of the moth is effected principally by pleasure driving, electric cars, and what is most important of all, automobiles. The advent of the latter class of vehicles has greatly complicated the prevention of the spread of the pest, and makes it all the more imperative that we should keep clean the trees that border our main roads. Other minor methods of distribution are eggs deposited on barrels, packing boxes, summer furniture standing out of doors, etc.

"The Brown-tail Moth found its way to Somerville in the early nineties no doubt on rose bushes imported from Holland. The evidence in this case is circumstantial but strong. The insect is known to occur in Holland, is known to form hibernating webs on roses, and the place where it was discovered in Somerville, Mass., in 1897, was directly in the rear of a florist's establishment, where a specialty was made of importing Dutch roses, growing them for a season and then selling them to the Boston department stores. The female moths of this species fly freely, and are often carried long distances by the wind. They are also strongly attracted to light. Cases are on record where these strong flying females have come on board vessels some thirty miles off the New England coast. It is not surprising then that the Brown-tail Moth has already spread to Rhode Island, Massachusetts, Vermont, New Hampshire, Maine, New Brunswick and Nova Scotia. The line of spread is naturally that of the prevailing winds during July, which in New England usually blow to the north-east. It seems probable that in comparatively few years this insect may be found generally scattered throughout New England and Eastern Canada.

"The biology of the insects is briefly this: in the case of the Gypsy Moth the eggs hatch about the last week in April, the caterpillars, which feed on all kinds of foliage are full-grown about the middle of July. Words cannot describe the havoc wrought by these caterpillar swarms. In early July of the past year, some 3,000 acres of mixed woodland in Eastern Massachusetts were defoliated by the gypsy caterpillars, and left as bare as in winter. They feed on all trees, nearly all crops, and often invade houses by the hundred. No more pitiful and at the same time disgusting sight can be conceived than a gypsy moth outbreak at its height. No wonder that in the olden days before the science of economic entomology was dreamt of, people so afflicted sought a remedy through pr yer, or that they regarded the pest as a device of the Evil One. The pupal stage extends to about the 1st of August, while the moths are from a week to ten days in depositing their yellow, hair covered egg clusters. The egg clusters are laid on tree trunks, stone walls, houses, fences, and old tin cans—in fact, in all places where the caterpillars may go to pupate. The female seldom moves far from the pupa case from which she has emerged.

"With the Brown-tail Moth the eggs hatch about the middle of August, and the young caterpillars feed at the tips of the twigs, preferably those of fruit trees, until the approach of cold weather, when they draw together the leaves from which the epidermis has been removed, and spin them up with a most tenacious web, thus forming a hibernaculum within which they congregate to the number of two or three hundred, and thus safely pass the winter. The same warm weather that causes the buds to swell the following spring brings out these small caterpillars, which feed on buds, blossoms, and leaves, and when abundant, often strip entire orchards and groves of oak. Aside from the damage to trees the hairs of the caterpillars are intensely poisonous and cause a severe and most painful eruption of the skin whenever they come in contact with it. By the middle or latter part of June, the insects are fully grown when they spin cocoons, often in masses at the tips of twigs, on fences, and even house walls. From the 12th to the 15th of July the white, brown-tail moths emerge, fly freely, mate principally by night, and the females at once begin the work of oviposition. Some four or five days are consumed in this process by which time the brown, elongated, hair-covered egg masses have been securely attached to leaves at the tips of twigs. Hatching takes place in from three to four weeks.

"For remedial measures against the Gypsy Moth we have found spraying done in the early caterpillar season the most valuable of any single method. Power sprayers, throwing the spray under heavy pressure have proved the most economical, as far as street tree and orchard work is concerned, and also, in those woodlands which are accessible to heavy machines. In woodland spraying, however, the thinning of trees, and cutting out of underbrush is an indispensable prerequisite, and this preliminary work is usually done during the previous fall and winter months. In spraying against the Gypsy Moth, arsenate of lead paste at the rate of 10 pounds to 100 gallons of water gives the best results. On rough or rocky hillsides, and in other places where the power sprayer cannot be worked to advantage, hand spray pumps are freely used with good results. As the caterpillars approach maturity, they show considerable resistance to poison, and further acquire the odd habit of feeding by night and hiding by day in sheltered places. Taking advantage of this habit we band the infested trees with strips of burlap, beneath which the caterpillars assemble in the early morning hours, and where they may be destroyed at any time by hand during

the day. Later in the season, the pupæ and female moths are crushed by hand or creosoted wherever found, while after the eggs are laid coal tar creosote applied with a brush to the egg masses completely destroys them. This creosoting of the egg masses is carried on throughout the fall, winter and spring, and is a most effective though somewhat expensive method. In badly infested woodlands we thin the trees, cut the brush and treat the egg masses on the trees left standing. The following spring we band the remaining trees with some sticky material to prevent the ascent of the young caterpillars, and as soon as all the eggs on the ground have hatched, a light fire is run over it, thus destroying the caterpillars by the million. These are the principal methods directly used for destroying this insect. As a matter of policy we have attempted first to stop the scattering of the moth by treating a 100 foot belt on each side of all our main roads. This prevents the caterpillars from spinning down and dropping on vehicles. In this way, over 8,000 miles of roads have been covered during the present season. Next, we have endeavored to do the greatest good to the greatest number of our people by clearing all the important residential sections of the moth, and certainly 90 per cent. of them have been so cleared and protected. There now remains the great woodland problem concerning which we are most anxious, but which we can solve if given sufficient time and money.

"In combating the Brown-tail Moth the natural and most effective measure is to cut off the winter webs, gather them carefully and burn them. This work is best done when snow is on the ground. Where this has been neglected a spraying with arsenate of lead, six pounds to one hundred gallons of water early in the spring will suffice to destroy the insects. In actual field practice the winter work of cutting off brown-tail webs, and of creosoting gypsy moth nests goes on at the same time and with the same gang.

"In opening this informal talk I spoke of the balance of nature; and how injurious insects in their natural environment are ultimately held in check by their parasites. In Eastern Massachusetts we are endeavoring to secure this balance of nature in connection with the moth pests by the importation from Europe of the parasites of both moths. Our State has made liberal appropriations (some $45,000) for this work, which I have placed under the oversight and direction of Dr. L. O. Howard, Washington, D.C., than whom no one in the country is better qualified to direct. Dr. Howard has made several trips abroad for us and engaged a competent corps of collectors in all parts of Europe where the moth occurs. He has also given us the benefit of his advice at all times, and the services of one of his trained assistants who has spent nearly all his time in Eastern Massachusetts looking after the material when it arrives. We have provided for this important work a well-equipped laboratory, and a large number of assistants, and during the past year over 100,000 different forms of parasites of the moth have been bred from European material and liberated in our infested district. We have imported several important Ichneumonids, a very large number of Pteromalids, thousands of Tachinids, and also a large number of predaceous beetles of the genus *Calosoma*. When a sufficiently large number of any of these parasites is obtained at any one time they are liberated directly in the field. Otherwise, they are bred up to the requisite number in outdoor cages and then liberated. What the outcome of this exceedingly interesting scientific experiment shall be, is, of course, problematical. We know already that certain important imported species have established themselves in our State, and are hopeful that another season will show that many others have done likewise. At any rate, the best

available scientific skill is being brought to bear on the problem, while ample financial support has been provided by the State. Both Dr. Howard and myself are very hopeful for the successful outcome of this undertaking. If it can not be gained under present conditions, it can not be gained at all.

"While such great insect invasions are at first glance most discouraging, I am not one of those who regard them wholly as an unmixed evil. I believe that there is in them a certain element of benefit to the community at large. By the attacks of these hordes of insect pests we gain a better appreciation of the value of our trees and crops. We are led to study their needs more closely and to administer to those needs more thoughtfully and efficiently than before, and from thus getting in closer contact with a few forms of life our interests and sympathies become broadened in their relation to the whole living world."

VOICES OF THE NIGHT.

By Rev. Thomas W. Fyles, D.C.L., F.L.S., Levis, P.Q.

Eight years of my early life in Canada were spent in a very beautiful, but comparatively newly settled district in which there was much of the primeval forest remaining. Some of the first settlers were still living there when I took up my abode in the neighborhood. These men told of the nightly howling of the wolves on the hills when they first began to clear the lower lands, and of their encounters with various wild animals in the woods.

My duties at that time took me frequently from home, and my solitary return journeys were necessarily made at night. Driving on the mountain roads, and through the forest, and by the lakes and streams of the locality, I had fine opportunities for studying the "Night Side of Nature"—I use the words in a different sense from that in which Mrs. Crowe used them.

I pity the man who, living in the country, cannot find, at all hours, by day or night, in summer or winter, sights and sounds to interest and instruct him. I pity the man to whom

> "The gracious prodigality of Nature
> The balm, the bliss, the bfeauty and the bloom"

do not appeal. A solitary drive on a country road has always been to me an occasion for rich enjoyment. The many voices of animate creatures—aye, and by a figure, of inanimate objects, also, have formed for me, many a time, a concert well worth listening to.

To speak of the voices of inanimate things I shall never forget one glorious night when the Aurora Borealis held possession of the sky. From the zenith to the horizon, like the ribs of a vast umbrella, but streaming, quivering, vibrating, the rays descended on every side, I stood in admiration, and became conscious of a strange sound. Was I mistaken? I listened intently. I could hear the distant fall of the water over the mill-dam—it was distinct from that. It was like the gentle shaking out of a stiff piece of silken goods. It was a sound of which travellers in Arctic regions have told us—it was the voice of the Aurora.

Who is there who has passed through a grove of pines in the darkness but has noticed the slumberous sighing of the foliage shaken by the night air? I have often listened to it.

Turning now to the consideration of the notes of animate creatures—what a mournful cry was that of the Loon, or Great Northern Diver, as it passed from one sheet of water to another! It was a weird sound coming from far overhead in the stillness of the night, and soon to be answered, from near or far, by the cry of the companion bird.

Sometimes, in the spring or fall, it was very startling to the lonely traveller in the night to hear a—

"—rush as of harpy wings go by."

accompanied by a constant trumpeting of "*conk-conk.*" Looking up, he would see a phalanx of dim forms speeding onward as if to charge an enemy. The sounds came from a flight of wild geese winging their way, to or from, their breeding-ground in the north.

And these sounds would, perhaps, arouse a fox, who would answer them from the hill-side with his short sharp bark.

In those days I often heard the rollicking hearty call of the Great Horned Owl, "*Wo-a-ho-a-hoa,*" shouted from one mountain top, and answered from another by its mate.

Birds of this fine species were numerous in that neighborhood, and sometimes became so bold as to visit the farm yards. A farmer on opening his door early one morning, saw a splendid specimen of the kind blinking and looking very wicked, and fastened to a large, white gander that it had killed. In its efforts to fly off with its prey, it had dug its claws deeper and deeper into the flesh, till it was unable to disentangle them; and, as the gander was too heavy for it to lift, the spoiler became a captive.

A cry less frequently heard, and heard only in the Winter was the dull, heavy "*Bump-bump*" of the Snowy Owl. This bird comes south in the cold weather, but breeds in Arctic regions.

Another sound that I often paused on my way to listen to, was in those days accounted a mystery. Its cause was not known. I will read to you what Gosse, the Canadian Naturalist, said of it:—

"Listen to the singular sound proceeding from yonder cedar swamp. It is like the measured tinkle of a cow-bell, or regular strokes upon a piece of iron quickly repeated. Now it has ceased.

"There it is again. I will give you all the information I can get about it; and that is very little. In Spring, that is, during the months of April, May, and the former part of June, we frequently hear, after nightfall, the sound you have just heard; from its regularity it is usually thought to resemble the whetting of a saw, and hence the bird from which it proceeds is called the Saw-whetter. I say 'the bird,' because though I could never find anyone who had seen it, I have little doubt that it is a bird. I have asked Mr. Titian Peale, the venerable Professor Nuttal, and other ornithologists of Philadelphia about it, but can obtain no information upon the subject of the author of the sound; it seems to be—

'Vox et præterea nihil.'

"Carver, in his amusing travels, mentions it as being heard near Lake Superior, naming it, if I recollect rightly, the Whet-saw. It may possibly be known, but I find nothing of it in Wilson or Bonaparte. Professor Nuttall was acquainted with the note, but told me plainly the bird was unknown. I conjecture it may be some of the herons or bitterns, or, possibly, from a passage in Bonaparte's Ornithology, the Evening Grosbeak (*Fringilla vespertina*). He says of that bird, 'their note is strange and peculiar; and it is only at twilight that they are heard crying in a singular strain. This mournful sound, uttered at such an unusual hour, strikes the traveller's ear, but the bird itself is seldom seen.'"

The sound is really produced by one of the smallest of the Owl family (*Cryptoglaux acadica*). Who it was that first made known the fact I do not know, but it is well established now.

I once saw a pair of these comical owls perched on the roadside fence, where a small brook crossed the way. I was in my waggon; and the confident yet inquisitive looks they gave me were very amusing. Probably, if I had attempted to leave the waggon, they would have flown quickly enough. I inferred that they had come to the brook in search of frogs.

Night-jars were plentiful in that part of the country in the summer. After night-fall they could be dimly seen overhead, hawking for moths and beetles. Their rapid movements, as they chased their prey, were not unlike those of the Tumbler Pigeon. And as they flew they uttered their plaintive call.

Once in a long while the scream of the lynx was heard in the night in that locality, as it was in the day time also. A little son of my next neighbor was passing through the woods one day when he was terrified by the cry of this animal. He started to run; and the lynx bounded along—all four feet in the air at once, after the manner of its progression—keeping a short distance on one side, and uttering repeatedly its startling cry, probably to call its mate. Whether the pair would have attacked the child I cannot say. Happily the sound of a woodman's axe was heard, and this guided the little fellow to safety and frightened the beast away.

In the early Spring the Frog Concert came off with great *eclat*, and was continued night after night. In it were heard the piccolo notes of the tree frog, the trombone of the bull frog, the cackling, croaking, rattling tattoo of the common frog, and now and then, like the jingle of the triangle, the "tr-r-r-r-ill" of a toad.

There are other sounds that break the stillness of the night—sounds produced by living creatures, but which can only by a figure of speech be termed the "voices" of the existences from which they come. To use the words of Ben Jonson:

> "The scaly beetles, with their habergeons,
> Do make a humming murmur as they fly."

Lachnosterna fusca, Fröhl, is the beetle that comes from the large white grub that is dug up so often in our gardens. Its shards, or elytra, are held erect while the true wings which are membraneous really bear the insect up, and by their vibrations produce the humming sound.

The impertinent "twang" of the mosquito is produced in like manner; and it is wonderful that wings so delicate and frail in appearance as those of the mosquito can be exercised with such rapidity as to produce so shrill a sound.

The antennæ of insects are supposed to serve instead of ears; and it may be that long and delicate antennæ with which many of the smaller kinds of Neuroptera are supplied were intended to catch the pulsations in the air caused by the rapid vibratory action of the minute wings of their compeers. Sounds we cannot hear are in all probability made known to the tiny companions of the creatures that produce them.

The wayfarer in the dusk of evening, who will pause near a patch of the Silk-Weed (*Asclepias cornuti*) in full blossom, will probably hear a distinct and continuous humming caused by the motion of the wings of the Sphinges and other moths, that flit from plant to plant, or hover over the blooms, and through their long and slender trunks, imbibe the nectar that Flora in her bounty has provided for them.

As the Summer advances, on nights when the weather is calm, the whole atmosphere seems to palpitate with the multitudinous calls, shrillings, chirrupings and sibillations of various orthopterous insects. The Naturalist with a good ear who will take Scudder for his guide,* and endeavor to distinguish between the notes of the different serenaders will have set himself an interesting task.

Day and night the Naturalist finds entertainment and food for reflection. It must be said though that the pursuit of Natural History is not always free from danger.

It is the custom, you know, for Entomologists to spread a mixture of molasses and rum upon the bolls of trees at nightfall, to attract Noctuids and then, at intervals, to visit the baits, carrying a dark lantern and the useful cyanide bottle.

A party of Montreal gentlemen were engaged in this "sugaring"—as it is called, in the outskirts of their city, when the sound of a pistol-shot broke the silence, and the *ping* of a bullet sounded unpleasantly near them. I need hardly say that their sugaring operations were abandoned for that night.

And this story reminds me of an experience of my own, in the long ago, when I was young and enthusiastic.

There was a wood about three miles from the town where I was living, and about the same distance from any other place—it was a lonely wood, I was accustomed to resort to it for Entomological researches. It was a grand hunting-ground; and I knew every part of it thoroughly. I was never disturbed nor molested there by anyone. I became very bold; and one night I determined to go there for sugaring purposes. I took a jar of prepared sweets, a dark lantern, and a supply of chip boxes; and I reached the wood about eleven o'clock. I had fairly entered and was preparing for work, when *bang! bang! bang!* broke upon my ear. I was startled you may well believe; but I understood the position in a moment; there were poachers in the wood shooting the pheasants at roost in the trees; and the men were but a few rods away. I said to myself, "If these men come upon me they will take me for a game-keeper; and if the game-keepers, hearing the guns, should hasten to the wood and find me here, they will take me for a poacher. In either case I shall fare badly." So I thought discretion the better part of valor, and made for my home as quickly and as quietly as I could.

It may be asked, of what interest to *Entomologists* are the Loon, the Fox, and the other creatures you have spoken of? To come to an answer you must follow a concatenation, such as that which connected the "priest all shaven and shorn" with "the malt that lay in the house that Jack built" and say:—

This is the Loon
That swallowed the Frog
That fed on the Gnats
That troubled the Folk
That lived in the house that Jack built

This is the Fox
That killed the Hen
That ate the Grigs
That leapt in the grass
That grew round the house that Jack built.

I remember a conversation that I had with the late Sir William Dawson. We were speaking of the Entomological Society of Ontario. He said. "I see that you have Geological, Ornithological, and Botanical Sections of your Society. We have regarded the studies that these pursue as of more importance than that which you make your chief consideration. The whole is greater than its part. But your proceedings show how one branch of Science intertwines with others."

* (See "Songs of our Grasshoppers and Crickets," by Samuel H. Scudder, Twenty-third Report Ent. Soc. of Ontario, 1892, page 62).

I trust then that my reference to animals, birds and reptiles will not have been deemed inappropriate on this occasion.

Dr. Fletcher, in expressing the thanks of the audience for the interesting addresses that had been given them, drew attention to the wonderful success which had attended Mr. Kirkland's efforts. He had himself spent some time in Massachusetts during the early part of the summer and had seen what was being done. Mr. Kirkland was one of those all-round men who realized that each branch of knowledge had a close relationship with every other branch. He was not only a good entomologist, but also a good chemist, and he brought his chemical knowledge into practical use to aid his entomology. As a result he showed all North America the great value of arsenate of lead as an insecticide. Mr. Kirkland's task was the most extensive experiment in economic entomology that had ever been undertaken in the United States or in any other part of the world, but he is a man of great executive ability and is able to organize and control his great staff of 1,700 men and to use to the best advantage the large sums of money provided by the State Legislatures and Municipalities for the suppression of the Gypsy and Brown-tail Moths. We in Canada are deeply interested in the work inasmuch as the latter of these pests has invaded Nova Scotia and is producing consternation and dismay among many fruit-growers there.

SECOND DAY'S SESSION.

The President, Dr. Fletcher, took the chair at 10 o'clock in the Biological lecture room of the Ontario Agricultural College, Guelph. There were present during the day a large number of students in addition to the members of the Society. The first order of the day was the reading of the reports of the Council, the branches of the society at Montreal, Quebec, and Toronto, and of the Treasurer, Librarian, Curator and the Delegate to the Royal Society of Canada. This was followed by the election of officers for the ensuing year 1907-8, which resulted as shown on page 6. Dr. Fletcher was re-elected president, as were also the other officers with the exception of the delegate to the Royal Society, for which position Mr. Arthur Gibson, of Ottawa, was chosen in succession to Mr. A. F. Winn, of Montreal.

REPORT OF THE COUNCIL.

The Council of the Entomological Society of Ontario begs to present its report for 1906-7.

The forty-third annual meeting of the Society was held at its new home in the Ontario Agricultural College, Guelph, on the 10th and 11th of October, 1906, and was attended by many members from a distance and also by a large number of students of the College and Macdonald Institute.

The first afternoon was devoted to a conference on the Codling-worm, during which its whole life history was discussed, the value of parasites as a means of control was considered and many practical points were brought out by the various speakers who took part in it. This was followed by the

Reports on Insects of the year presented by the directors from their respective divisions of Ontario.

In the evening a public meeting was held in the Massey Hall which was nearly filled with an appreciative audience in spite of the inclemency of the weather caused by the first snowstorm of the season. After a hearty welcome from President Creelman, the President, Mr. John D. Evans, read his address, and was followed by a paper on "What the Entomological Society of Ontario can do for the Ontario Agricultural College," by Professor Lochhead, and a description of "A Canoe trip for Entomological Purposes through the Algonquin Park"—illustrated by a number of original lantern views—by Mr. Paul Hahn, of Toronto. The second day was occupied with the reading of reports from the branches and officers of the Society and a series of scientific and practical papers, all of which have been published in the annual volume.

This volume, the 37th Annual Report to the Legislature of Ontario, was published in May last and contained 120 pages, a portrait of the retiring President, Mr. John D. Evans, and six beautiful half-tone plates of Galls from a variety of trees. Besides the papers already referred to it included the following articles: "A Hunt for a Borer," by Mr. H. H. Lyman; "Two Insects affecting Red Clover and Seed Production," "Insect Galls of Ontario," "The Locust Mite," and "The Oyster-shell Bark Louse," by Mr. T. D. Jarvis; "Hemiptera," "In the tracks of *Nematus Erichsonii*" and "The Notodontidæ of the Province of Quebec," by Dr. Fyles; "Basswood, or Linden, Insects" and "The Bean Weevil," by Mr. A. Gibson; "Insects injurious to Ontario Crops in 1906" and "The Entomological Record, 1906," by Dr. Fletcher; "Injurious Insects of 1906 in Ontario," by Prof. Bethune.

A summer meeting of the Society—the first for a great many years—was held at the Ontario Agricultural College on the 4th and 5th of July. Through the kindness of President Creelman, the members from a distance were hospitably entertained in the College residence during their visit, and the ladies of the party were provided for in the Macdonald Hall. There were present also a number of Ontario teachers who were taking a summer course of Nature Study at the Macdonald Institute, and several students and members of the College staff. The first afternoon, the President, Dr. Fletcher, occupying the chair, papers were read by Mr. Lyman on the distinction between *Thecla calanus* and *Edwardsii;* Dr. Brodie on the life-history of a colony of Tent Caterpillars and the parasites infesting them; Dr. Fletcher on the control of the Gypsy and Brown-tail moths in Massachusetts by the importation of parasites from Europe, and Mr. C. W. Nash on "Balance in Nature." In the evening Dr. Henry Skinner, of Philadelphia, gave an interesting lecture on "Insects as Carriers of Disease;" Mr. Nash spoke upon "Instinct *vs.* Education," and Dr. Fletcher gave an instructive address on "Nature Study as a means of Education." The second day was devoted to an excursion to Puslinch Lake, about sixty taking part in it; after some hours spent in collecting entomological and botanical specimens, short addresses were given by the College staff and others upon the various objects of interest that had been brought in.

At a subsequent meeting of the Council, Mr. L. Caesar, O. A. College, was elected secretary for the remainder of the year in place of Mr. E. J. Zavitz, who resigned on account of the pressure of his duties in the Department of Forestry, which left him no time to devote to the business of the Society.

The Canadian Entomologist, the monthly magazine of the Society, has been regularly issued at the beginning of each month. The 38th annual volume was completed in December last, and ten numbers of the 39th volume

have now been published. The volume for 1906 contains 425 pages and is illustrated with four full-page plates and 48 figures from original drawings. The contributors numbered 66 and included writers in Canada, the United States, Hawaiian Islands, England and Jamaica.

From October to the middle of May meetings of the Society were held in the Biological lecture-room on alternate Wednesday evenings, and occasionally more frequently. The members of the Wellington Field Naturalists' Club joined with those of the Society in the proceedings and thus a variety of biological subjects were discussed in addition to those of an entomological character. The attendance was very satisfactory, many Nature Study students and members of the third and fourth years being present at most of the meetings.

The reports from the branches of the Society at Montreal, Quebec, Toronto and British Columbia are very satisfactory, meetings having been regularly held and many papers read and discussed. The last named branch has published a quarterly Bulletin containing lists of British Columbia insects of various orders and many highly interesting notes and observations.

The newly organized Entomological Society of America held its first meeting in New York at the end of December last. It is gratifying to record that our Society was recognized by the election of Dr. Fletcher as first Vice-President, and Dr. Bethune as a member of the Executive Committee; both these gentlemen are also original Fellows of the new Society. In August the Society held its second meeting at Boston during the sessions of the Seventh International Congress of Zoologists; Dr. William Saunders, of Ottawa, and Mr. H. H. Lyman, of Montreal, two of our members of long standing, were elected Fellows, and Dr. Bethune, one of the two representatives of the Society on the Council of the American Association for the Advancement of Science.

James Fletcher, President.

ANNUAL REPORT OF THE MONTREAL BRANCH.

The 284th regular, and 34th annual meeting of the Montreal Branch was held on May 11th, at the residence of Mr. Geo. A. Moore, 209 Prince Arthur Street.

The following were present:—Mr. G. A. Moore in the chair; Messrs. H. H. Lyman, G. Chagnon, E. C. Barwick, E. Denny, A. E. Norris, E. Kollmar, G. R. Southee, C. W. Sach, A. F. Winn.

The Secretary read the following report of the Council:

During the year, meetings have been held monthly, excepting in July, August and September, the attendance averaging seven members. Four new members have been added to our roll, Messrs. M. W. Davis, C. S. Fosbery, E. Kollmar, C. W. Sach.

A field day was held on May 24th at St. Hilaire, and several members attended the outing of the Natural History Society at St. Gabriel de Brandon.

The papers read at the meeting were:

"Reflections and Suggestions," Henry H. Lyman.

"St. Hilaire, May 24, 1906," G. A. Moore.

"Notes on Coleoptera collected by Mr. Moore at Como, Que.," G. Chagnon.

"Collecting Catocalae in the day-time," E. Denny.

"Collecting Hemiptera at Como," G. A. Moore.

"The Genus Chrysbothris, with notes on Canadian Species," G. Chagnon.

"Clastoptera," G. A. Moore.

"Thecla calanus and T. Edwardsii," Henry H. Lyman.

Specimens of the following genera of moths were brought together at the various meetings for comparison and study:—Xylina, Acronycta, Datana, Hadena, Feltia and Heliophila, resulting in a better knowlege of these groups, and the correction of several errors in identification.

Your Council would again urge the members to write short notes for the meetings, and also to prepare for the fall meetings, reviews of the summer's work in the field, experiences in breeding species, studies of habits, etc.

Additions to our collection of specimens, books and photographs should not be forgotten.

St. Madeleine, Que., has been suggested as a locality suited for the field day on May 24th.

Respectfully submitted,

(Signed) Geo. A. Moore,
President.

The treasurer's report showed a balance on hand of $59.40. The reports of the curator and librarian were also submitted and adopted.

The following officers were elected:—President, Geo. A. Moore; Vice-President, E. C. Barwick; Sec.-Treasurer, A. F. Winn; Librarian and Curator, L. Gibb; Council, G. Chagnon, H. H. Lyman, G. R. Southee, E. Denny.

REPORT OF THE QUEBEC BRANCH OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Quebec Branch of the Entomological Society of Ontario has pursued its useful course for a period of ten years.

We have had to mourn the demise of some of our members and to bid adieu to others who have moved to distant localities, but additions to our membership have from time to time encouraged us.

The authorities of Morrin College still allow the Branch to hold its meetings in that institution—a privilege that is highly appreciated by the members.

The past season has been, for the most part, an unfavorable one for entomologists, on account of the frequent rains, but much good work in collecting was done by our curator, Mr. A. R. M. Boulton. Such fine moths as *Ceratomia amyntor*, Geyer, *C. undulosa*, Walker, *Sthenopis argenteo-maculatus*, Harris, being taken by him.

Mr. Boulton also, on one of his excursions, discovered a batch of Hemaris larvæ, feeding upon a solitary bush of *Viburnum opulus*, Montmorency. The larvæ are true Sphinges in form and attitude; but they lack the transverse side-lines that other Sphinges have, and they do not bury themselves in the ground when full fed, but spin a slight cocoon among leaves above ground.

Another interesting batch of larvæ was brought from Miranda, P. Q., by Miss Johnson, one of our members. It was one of *Anisota Senatoria*, S. & A., a species that has not hitherto been taken at Quebec.

A case of valuable specimens from California was presented by Miss Freeman.

The Branch now numbers 28 members.

During the year papers were read by the President on *Hemiptera*, on the *Flora* and *Fauna* of the Province of Quebec, on "Voices of the Night," on

Insects injurious to Gardens and Fields, on the Asparagus Beetle (*Crioceris asparagi*) and on the Habits of Insects.

The members were hospitably entertained at the houses of the President and Mr. J. H. Simmons, and also by Mr. and Mrs. Geggie, at "Darnoc," Beauport, where a very enjoyable field-day was held.

At the annual meeting held on the 9th October, 1907, the officers for the coming year were elected as follows:—President, Rev. Dr. Fyles; Vice-President, Mrs. Richard Turner; Secretary-Treasurer, Lt.-Col. Crawford Lindsay; Council, Hon. Richard Turner, J. H. Simmons, Esq., Miss Bickell, Miss Freeman, Miss Hedge.

CRAWFORD LINDSAY,
Sec.-Treasurer.

REPORT OF THE TORONTO BRANCH, 1906-7.

The eleventh annual meeting of the Toronto Branch of the Entomological Society of Ontario was held in the Provincial Museum on Tuesday, June 18, 1907.

The President, Dr. Brodie, was in the chair and the following members were present:

Dr. Brodie, Mr. Williams, Mr. Webb, Miss Blackmore, and several visitors.

The Secretary read the following report:

We have pleasure in announcing a very successful and profitable year's work. Our membership roll is slightly increased, although one or two have dropped out.

In all we have had eight meetings and the average attendance of members has been nine. At all the meetings we have also had a number of visitors.

The papers read during the session have been instructive and entertaining, and some have presented material entirely new; at least to most of the members. Not a few have been illustrated by specimens, charts, and models, which added greatly to the value of the lectures.

LIST OF PAPERS, 1906-7.

1. Snout Beetles, Mr. Cosens.
2. Contributions of the 19th Century to the World's Knowledge, Dr. Brodie.
3. Nuptial Dance of some Insects, Dr. Brodie.
4. A week at Niagara, Mr. Williams.
5. An Early Writer on Entomology, Mr. Cosens.
6. Ancestors of Insects, Dr. Walker.
7. Insect Mimicry, Dr. Brodie.

Publications have been received from Ottawa and Washington, from the Ohio and Connecticut Experiment Stations, and from New York State Museum at Albany; and a donation of some Toronto beetles from Mr. Arthur Reston.

The Treasurer reported a balance in hand of $5.55.

The following officers were elected: President, Dr. Brodie; Vice-President, Dr. Walker; Secretary-Treasurer, Miss Blackmore; Librarian and Curator, Mr. Williams; Council, Mr. Hahn, Mr. Webb, Dr. Abbott, Mr. Ivy.

An excursion was made to Niagara Glen on June 8th. About 15 people went, and some very interesting collections were made, especially of shells.

E. BLACKMORE,
Secretary.

TREASURER'S REPORT.

For the Year ending August 31st, 1907.

Receipts.		*Expenditure.*	
Balance on hand Sept. 1, 1906.	$ 523 75	Officers' Salaries	$225 00
Members' fees	399 38	Annual Report	206 75
Legislative Grant	1,000 00	Printing Account	909 08
Sales of pins, cork, etc.	46 01	Expense account, postage, etc.	72 76
Sales of Can. Entomologist	203 81	Purchase of pins, cork, etc.	17 31
Advertising	16 00	Library	12 60
Bank Interest	6 66	Insurance of library and collections	26 00
Refund for rent in London	10 00	Expenses of annual meeting.	95 38
		Balance	640 73
	$2,205 61		$2,205 61

S. B. McCready,
Treasurer.

Examined and found correct this 25th day of October, 1907.
(Signed) J. W. Crow *and* B. Barlow, *Auditors.*

REPORT OF LIBRARIAN.

During the year ending August 31st, 1907, there have been added to the Library twenty-two bound volumes and a large number of periodicals, bulletins and pamphlets; a considerable portion of these will be bound up into permanent volumes during the next few months. Among the new books may be mentioned Folsom's Entomology, with reference to its Biological and Economic aspects; Sir George Hampson's Catalogue of the Noctuidæ in the British Museum, vol. vi.; and Barker's Anatomical Terminology.

48 volumes have been taken out by members during the year and the library has also been made use of for reference and consultation.

Respectfully submitted,
Charles J. S. Bethune,
Librarian.

CURATOR'S REPORT.

During the past year the Curator's work has consisted chiefly in the general care of the Society's collections, the inspecting of the cabinets for pests from time to time, and the placing in the cases of new specimens contributed by members of the Society. In addition to the general work the collections have been gone over and lists prepared of species particularly wanted to fill gaps and replace old and imperfect specimens in the Society's cabinets. These lists will be furnished to members of the Society and it is hoped that all members having spare specimens of the listed species will forward them to the Curator, with date and locality labels attached, in order that the Society's collection may be made as complete and perfect as possible.

Since the last report the following contributions have been made to the collections and our sincerest thanks are due to the generous contributors:

8 specimens of Lepidoptera by Dr. Fletcher, Ottawa; 2 specimens of Coleoptera by J. D. Evans, Trenton, Ont.; 2 specimens of Lepidoptera by C. H. Young, Ottawa; a large collection of Canadian and exotic Coleoptera by Henry S. Saunders, Toronto; 2 specimens of Lepidoptera by J. H. Cook, Albany, N.Y.; 2 specimens of Coleoptera by E. J. Zavitz, O.A.C., Guelph; over 200 species of Lepidoptera by F. H. Wolley Dod, Millarville, Alberta; 50 specimens of Lepidoptera by Charles R. Eby, Washington, and an extensive collection of Insect Galls by T. D. Jarvis, O.A.C., Guelph.

Since the Society's cabinets were installed in the Biological Building at the College, the collections have been constantly accessible to visitors and have been made great use of by the members of the Entomological Department to illustrate lectures and as an aid in the determination of the species submitted to the Department for identification. They have also been a great help to Third and Fourth Year students in naming specimens in the collections which they are requested to make as a part of their work in Entomology.

Respectfully submitted,

J. E. Howitt, *Curator.*

REPORT TO THE ROYAL SOCIETY OF CANADA.

The following is the report to the Royal Society of Canada from the Entomological Society of Ontario, through Mr. A. F. Winn, Delegate.

The most important event in our Society, during the past year, was the transferring of headquarters to Guelph from London, where they were established in 1872. This change was found necessary owing to the dying out of interest in Entomology in London, and Guelph was selected as being the place most suitable to secure the best interests of the Society, as well as being in accordance with the wishes of the Ontario Department of Agriculture. Aside from the fact that the Society already had a flourishing branch there with a large list of members, at the Agricultural College attendance at lectures in Entomology is compulsory for students in the second and third years, while in the fourth year some specialize in the subject and naturally become active members of the Society and thus ensure a continuity of work and interest.

The collections of books and specimens were moved without any damage whatever. The cabinets of specimens are now conveniently arranged for reference in a portion of the College Museum set aside solely for them. The books and pamphlets, which form a valuable collection of over 1,800 volumes are in a series of stacks in the fireproof Massey Hall Library Building, and are kept entirely distinct from the general library of the College.

Our magazine, "The Canadian Entomologist," has been issued regularly early every month. The 38th volume comprises 425 pages with four full page plates, and 48 figures in the text. The contributors number 66, spread not only through Canada but the whole of North America, and a few residing in England, the West Indies, and the Hawaiian Islands. Two new genera of insects are described and one hundred and fifty new species as well as a number of varieties.

Life histories of several species of insects are recorded, including among the Lepidoptera. *Barathra curialis* by Dr. Fletcher and Mr. A. Gibson; *Incisalia irus* and *I. augustus* by Mr. John H. Cook; Among the Hemiptera,

Mr. J. R. de la Torre Bueno gives the first full account of the Water-bugs *Belostoma fluminea* and *Ranatra quadridentata.*

The series of articles on Practical and Popular Entomology has been continued and the papers published last year are: The Dragon-flies and Damsel-flies by Prof. Franklin Sherman, Jr.; Household Insects by Prof. Wm. Lochhead; Winter Retreats of Insects by Rev. Dr. Fyles; Some Beetles of early May by Rev. Dr. Bethune; Work for June Caterpillar hunting by Mr. A. Gibson; Mites affecting Farm Homesteads by Mr. T. D. Jarvis; The Oyster-shell Bark-louse by Mr. T. D. Jarvis; The Bean Weevil by Mr. A. Gibson; The Locust Mite by Mr. T. D. Jarvis.

Articles descriptive of new species of Lepidoptera are by Mr. A. G. Weeks, Jr.; Mr. August Busck, Mr. A. Cosens, Rev. G. W. Taylor, Mr. John A. Grossbeck. Coleoptera by Mr. Chas. Schaeffer, and Mr. H. C. Fall. Hemiptera by Dr. E. Bergroth. Diptera by Miss C. S. Ludlow, Dr. M. Grabham, Hon. N. Chas. Rothschild. Hymenoptera by Mr. J. C. Crawford, Mr. Myron H. Swenk and Prof. T. D. A. Cockerell. Orthoptera by Mr. A. N. Caudell. Coccidæ by Mr. R. S. Woglum.

Papers on Classification include Mr. G. W. Kirkaldy's Catalogue of Aphidæ; The Classification of Culicidæ by Prof. S. W. Williston; The Perlidæ by Mr. Nathan Banks; Synopsis of Bees of Oregon, Washington and British Columbia, by Mr. H. L. Viereck and associates; Notes on the classification of the superfamily Miroidæ by Mr. G. W. Kirkaldy.

The following are among the papers on miscellaneous topics: A North American Entomologists' Union by Mr. H. H. Lyman; Records of Orthoptera from the Canadian North-west by Dr. E. M. Walker; The Burrows of Cicindela by Mr. W. T. Davis; A fossil Water-bug by Prof. T. D. A. Cockerell; The snow-fly, Chionea valga by Mr. C. N. Ainslie; Notes on Hemiptera taken near Lake Temagami by Mr. E. P. Van Duzee; Geometrid Notes by Mr. Richard F. Pearsall.

Space has been devoted to records of the meetings of the Branches at Toronto, Guelph, Montreal, Quebec and Vancouver which are all in flourishing condition. The appearance of the new books and pamphlets on Entomological subjects has been promptly chronicled.

The Society has, as usual, furnished the Ontario Department of Agriculture with an account of its annual meeting, and a number of articles of popular and economic nature. These have just been published under the well-known title of The Annual Report of the Entomological Society of Ontario. Report 37 contains 120 pages illustrated by 6 beautiful half-tone plates of insect galls found on plants of various kinds, 36 cuts in the text and a portrait of our last year's President, Mr. John D. Evans. Among the papers may be mentioned: Parasitism of Carpocapsa pomonella, (the Codling Moth), by Dr. Brodie; A Hunt for a Borer by Mr. H. H. Lyman; Insect Galls of Ontario, by Mr. T. D. Jarvis; Hemiptera, by Rev. Dr. Fyles; Injurious Insects of 1906 in Ontario, by Rev. Dr. Bethune; Basswood, or Linden, Insects, by Mr. A. Gibson; Insects Injurious to Ontario Crops in 1906, by Dr. James Fletcher.

Dr. Fletcher's Entomological Record for 1906 requires 19 pages, is full of notes on the occurrence and distribution of the rarer species of Canadian insects, and becomes each year more valuable.

In conclusion your Delegate drew attention to the fact that the much dreaded Brown-tail Moth had established itself in Nova Scotia and hoped that immediate and thorough action would be taken to rid the country of an insect, which, if allowed to breed without check would prove disastrous to the far famed apple orchards of the Annapolis Valley.

During the remainder of the morning and in the afternoon the following papers were read and briefly discussed: "Further notes on Hepialus Thule at Montreal" by Mr. H. H. Lyman, and "Notes on Collecting Sthenopis (Hepialus) Thule at Montreal" by Mr. E. Denny. (These two papers are published in the *Canadian Entomologist* for December 1907). "The Two-winged Flies of the Province of Quebec" by the Rev. Dr. Fyles; "The Scale Insects of Ontario," illustrated by a large number of specimens, by Mr. T. D. Jarvis; "An Unusual Outbreak of Halisidota Caterpillars" by Mr. Arthur Gibson; "A Remarkable Outbreak of the Variegated Cut-worm" by Prof. Bethune and Mr. L. Caesar; "Insects Injurious to Ontario Crops in 1907" by Dr. James Fletcher; "Insects of the Season, 1907" by Prof. Bethune; "The Entomological Record for 1907" by Dr. Fletcher. The session was brought to a close with the Presidential Address of Dr. Fletcher on "The Entomological Outlook in Canada." These papers will be found in subsequent pages of this report.

In the evening an illustrated lantern lecture was given in Massey Hall by Dr. E. M. Walker of Toronto, on collecting and rearing Dragon-flies, after which votes of thanks were accorded to President Creelman, the local officers of the Society and the lecturers. The meeting then adjourned.

COLLECTING AND REARING DRAGON-FLIES AT THE GEORGIAN BAY BIOLOGICAL STATION.

By E. M. Walker, M.D., Toronto.

During the summer of 1907, I spent two months at the Freshwater Biological Station, Georgian Bay, Ont., and there had good opportunities for studying the aquatic insect life, especially the Dragon-flies, which were particularly abundant both in species and individuals and to which a considerable amount of time was devoted.

In this work I was ably assisted by W. J. Fraser, who also continued the work for about three weeks after I left, and to whose keen observation and enthusiasm much of the credit of the work is due.

The Georgian Bay Biological Station, whose site is on one of the numerous islands about the entrance to Go Home Bay affords the entomologist almost ideal conditions for the study of aquatic insect life, combining as it does the advantages of a laboratory equipment with those of extremely varied natural surroundings in which a great many different kinds of aquatic environments are represented.

In addition to the laboratory building, the Station is provided with a dwelling house for the use of its working staff, a store-house for material, a tank and pumping engine to supply the laboratory with running water and a boathouse supplied with several small boats, fishing-nets and other collecting apparatus. The laboratory building is situated close to the water's edge and has an ample floor space of 20 x 40 ft., divided into a large general laboratory and 4 small rooms, used respectively as photographic, chemical, glassware and private rooms. The laboratory affords working space for 12 students and in its centre is a long aquarium table supplied with running water from the tank so that it is possible to keep under observation animals, such as fish-embryos or the inhabitants of rapid streams which soon die or at least do not thrive in an ordinary aquarium.

In view of its connection with the Department of Marine and Fisheries the work of the Station is primarily concerned with problems relating to pisciculture, such as the spawning habits of the various food fishes and the

natural history of the smaller forms of life upon which they feed. In this connection a knowledge of the life histories of the aquatic insects is of considerable importance, forming as they do a large part of the food of some of the fish. The food of the brook-trout for example as Prof. Needham has shown (Aquatic Insects in New York State, Bulletin 68, N.Y. State Museum) consists almost entirely of certain aquatic insect larvæ, particularly those of a certain Chironomid fly, while other small dipterous larvæ, caddis worms, etc., contribute a considerable proportion.

At Go Home Bay we frequently found the stomachs of the common sucker filled almost exclusively with the full-grown nymphs of the large May-fly (*Hexagenia bilineata*) which breeds in enormous numbers in the bays and channels in that locality, and many other instances could be given of insects forming an important part of the food of fish.

A considerable portion of the two months which I spent at the Station was accordingly devoted to this branch of the work, most attention having been given to the Dragon-flies, as the group with which I was most familiar and one which was very abundantly represented there.

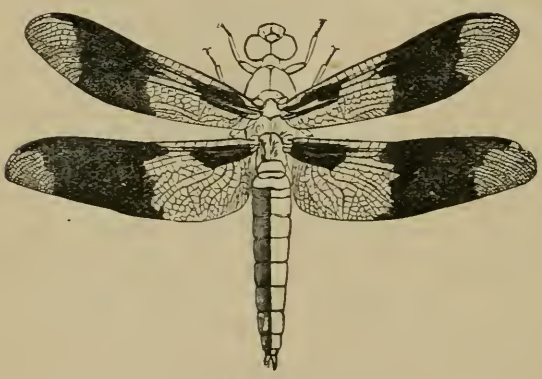

Fig. 4. Dragon-fly.

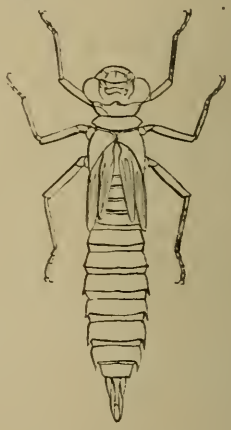

Fig. 5. Nymph.

Fig. 6. Larva seizing its prey and the Dragon-fly emerging from the Nymph.

Fig. 7. Damsel-fly.

Fig. 8. Nannothemis bella.

Life-History of Dragon-flies.

All Dragon-flies (Fig. 4.) are aquatic in their early stages and all inhabit fresh or occasionally brackish water. The eggs are deposited by the female upon various aquatic plants or freely upon the surface of the water, either singly or in clusters of varying size, sometimes enveloped in a gelatinous mass like those of snails or frogs. On hatching the young nymphs at once begin the active predaceous life which is characteristic of the whole tribe. They feed upon all kinds of small aquatic life, such as other aquatic insects, snails, tadpoles, or even small fish, which they grasp by means of a pair of hooks at the end of the enormously developed labium. This structure when at rest is folded under the head, concealing the mouth-parts like a mask, but when a small insect or other suitable animal chances to pass near by, it is suddenly thrust out with lightning speed and the victim drawn back within reach of the powerful mandibles (Fig. 6.). The length of the nymph's life varies greatly in different species, sometimes 3 or 4 years being required to reach maturity. When ready for transformation the nymph crawls out upon some suitable support such as a rock, reed or log, the choice of this support and its distance from the water's edge varying in different species (Fig. 6). In a few minutes the thorax begins to bulge, the skin splits along the median line and across the head, and the insect gradually emerges, the thorax appearing first, then the head, wings, legs and finally the abdomen; the latter is at first comparatively short and stout but rapidly elongates and at the same time the wings expand. The coloration is at first very pale and indefinite and it generally requires at least a day before it is fully mature.

Transformation usually takes place early in the morning and hence this is an excellent time for collecting material, for one can often get the imagoes of good species, together with the exuviæ of their nymphs, which retain the form of the latter perfectly and are therefore invaluable as specimens. The imagoes with their exuviæ are best collected in paper bags, in which they can be kept until the colors have matured.

Nymphs (Fig. 5.) of different species inhabit different aquatic environments and all such should be thoroughly searched. The best apparatus for general collecting is the sieve-net devised by Prof. Needham (Bull. 39, U.S.N.M.). This is a deep galvanized iron tray with a bottom of galvanized wire-screen. It can be made like a rake as a combination of net and sieve.

Most nymphs are easily reared in ordinary aquaria though some require running water. We used large, glass jars, covering the top when necessary with cheese cloth. A quantity of the rubbish in which the nymphs naturally live should be placed in the water and a few branches or boards for them to crawl out upon at the time of transformation. A sufficient quantity of aquatic plants must be used to keep the water fresh and the rubbish containing the nymph's food changed once a week.

As already observed the natural conditions which obtain in the vicinity of Go Home Bay are very well adapted to the study of aquatic insect life. Lying at the mouth of the Go Home River, one of the outlets of the Muskoka Lake system, it is within easy reach of a variety of different kinds of aquatic environment, representing all the transitions from the open lake to the sheltered river system. There are the rocky islands and reefs in the open lake, wind-swept and wave-tossed and either wholly barren of vegetation or affording but a scanty sustenance to a few stunted pines, junipers and other hardy plants in the crevices of the rocks, while further inland there are the deep quiet waters of the bay with numerous wooded islands,

and finally the moving water of the Go Home River. Then at many points along the irregular shores of the mainland and the larger islands, shallow inlets with sandy or gravelly bottoms and a luxuriant aquatic and shore vegetation support a widely different fauna from that of the more exposed parts, while finally there are numerous small inland lakes, which again present conditions quite distinct from any of those already mentioned. Their shores are sometimes rocky and bare in places but are for the most part swampy; floating sphagnum bogs being a special characteristic of the margins of these lakes. These are often gems of natural beauty and are of great interest to both zoologists and botanists on account of the many rare and interesting forms, mostly of a boreal character, which are met with here.

The first collecting trip after my arrival at the Station was made on June 16th to one of the larger of these enclosed lakes. The black flies were so tormenting that collecting, especially in a sheltered spot like this, was by no means a pleasure and even in the more exposed islands their numbers were sufficient to cause us considerable annoyance. But few dragon-flies were as yet abroad and these had for the most part not yet attained their mature coloration. *Libellula exusta*, Say., was the most abundant and continued to be so throughout a large part of the season. It is not common with us at Toronto but here, particularly during July, was extraordinarly numerous everywhere in the woods, but especially about these lakes and in the shallow swampy inlets. The female is inconspicuously colored but the males have their bodies covered in part by a bluish-white bloom which renders them very conspicuous when chasing each other over the water or resting on the rocks and logs. We found the nymphs of next year's brood in large numbers in the red-rotten vegetation at the bottoms of these lakes and the exuviae where commonly found adhering to the sedge and grass near the water's edge.

Another Dragon-fly of very different structure and appearance but frequenting the same sort of waters, is *Gomphus spicatus*, Selys. This was also met with on our first trip in considerable numbers and continued to emerge for some days afterwards. It belongs to a group whose nymphs are burrowers and in accordance with such habits are more or less flat with legs adapted for digging. They live in the silt at the bottom of lakes, ponds and streams, the tip of the elongated abdomen being held above the surface for breathing purposes. The imagoes, like most species of the genus, are dark brown with yellow bands and spots, rather small, widely separated eyes and a more or less club-shaped abdomen in the male. They also have the characteristic Gomphine flight, which though swift is generally very short, the insect constantly alighting, usually upon flat ground, seldom perching upon twigs after the manner of Libellulines. *G. spicatus* became very abundant at Go Home but like most of its congeners it is comparatively short-lived and by the middle of July has almost disappeared.

A third species of which only freshly emerged examples were taken on this date was *Leucorhinia frigida*, Hag., a small Libelluline of distinctly northern distribution which is quite absent from the fauna of southern Ontario. It became one of the most abundant Dragon-flies at Go Home Bay and was especially characteristic of the small lakes, while our common southern species *L. intacta*, Hag., was but rarely met with. Its nymphs had never been found before, but we obtained them in large numbers and reared them without difficulty.

Four other species were also taken on this date, two common little Damsel-flies or Agrionidae, the little blue *Enallagma Hageni* (Walsh)

and the wide-spread *Ischnura verticalis* (Say), that familiar little green and black species with the blue-tipped abdomen; and two species of *Tetragoneuria*, the common *semiaquea* (Burm.), and the larger and more northern *spinigera* (Selys.). The former is common everywhere in southern Ontario, but I have never seen them in anything like such large numbers as they appeared at Go Home Bay, especially about the last week in June, when on hot still days they positively swarmed in favorable spots. They breed most abundantly in the little marshy coves along the shore, and here the exuviae were sometimes so numerous that a single reed or grass stem would bear half a dozen of them.

Next day we went to the 'Chute,' a waterfall a short distance up the river. Here two other dragon-flies not often taken by the ordinary collector were found. These were *Didymops transversa* (Say), and *Basiaeschna janata* (Say.). The former is a brown insect with clear wings, the abdomen transversely banded with pale yellow and distinctly club-shaped in the male, while the latter is closely related to the various members of the genus Aeschna, those large dragon-flies with blue-spotted bodies that are so common in late summer. Both of these forms have the habit of following the shores of the lakes and streams in a regular beat so that if one stations one's self at some point along their course, one has a fair chance of capturing them as they pass by sweeping the net at them from behind.

The nymph *transversa* is a very curious spider-like creature with a round abdomen and long sprawling legs which clambers about the rocks along the shores of the bay and when ready to transform usually crawls several yards at least from the water's edge. The only other Canadian species allied to it also appeared at Go Home, but later in the season, namely about July 4, when *Didymops* had already disappeared. The nymph of this species (*Macromia Illinoiensis*, Walsh) closely resembles that of *Didymops* but the imago is a much larger and finer insect, a splendid dragonfly, black with a conspicuous yellow spot on the upper side of the abdomen and the sides of the thorax metallic green with an oblique yellow stripe. It has also superb aerial powers and great patience and determination is required to get many specimens.

Towards the end of June new dragon-flies were constantly making their appearance. On the Station Island, which lies partly well out toward the open bay, three species of Gomphus appeared about this time, *G. sordidus*, Selys., a large species, much resembling *spicatus* but quite different in habitat, appeared in great numbers, the nymphs crawling out from among the boulders along the shore and transforming upon the rocks close to the water's edge. In a few days the islands were covered with them but they were very short-lived, the great majority having disappeared by the first week in July. A few specimens also of *G. brevis* (Selys.), a short thick-set form, appeared about the same time but were found to be more characteristic of the rapids of the river, while a few days after the first *sordidus* emerged, *G. exilis* (Selys.), appeared, soon increasing greatly in number and showing a much wider choice of habitat than either of the others. While *spicatus* and *sordidus* were only accidentally found together, *exilis* was commonly associated with both of them. The food of these Gomphines seems to consist chiefly of May-flies, which are so abundant during their season of flight and which likewise disappear so suddenly.

More interesting than any of these, however, was the discovery of *Neurocordulia yamaskanensis* (Prov.), a species originally described from Mount Yamaska, Quebec. by L'Abbe Provancher, but which has been taken by very few collectors since then. Several years ago I obtained a number of nymphs and exuviae, of a kind unfamiliar to me, in Algonquin

Park, which were referred by supposition to this insect, as they clearly belonged to the same genus as *N. obsoleta* (Say.), the only other regional species and whose nymph was already known. This summer I had the good fortune to come upon the same kind of exuviae upon the timbers of the wharf at Go Home, where they had evidently emerged from water of considerable depth, 5 or 6 feet at least. Further search revealed others on the steeper parts of the rocky shores and on June 28th a special hunt for the emerging imagoes was made in the early morning. After protracted search, when we had almost come to the conclusion that their time for transformation was over, one was at last found in a wide crevice accompanied by its exuviae, and on subsequent occasions several more were obtained.

No imagoes could be found on the wing, however, and it became a subject of conjecture to us what became of them. One evening, however, some time after sunset, Mr. Fraser made the discovery that they were flying about the island in pursuit of May flies. Since then we took them repeatedly at almost the same hour, but at no time during the day were they ever seen upon the wing, except when started from a bush or tree where they were resting. This is the only case I know of a strictly crepuscular dragon-fly though several diurnal species, such as the Aeschnas, are known to fly until dusk.

Several other forms belonging to this same group of Cordulinae were met with but the only ones which occurred in large numbers besides the *Tetragoneurias* already alluded to, were the dainty and beautiful little *Dorocordulia libera*, (Selys.) and the large and striking *Epicordulia princeps*, (Hag.). The former with its delicate form and slender waist, its vivid emerald green eyes and dark metallic green body is one of our most exquisite dragon-flies. Its nymph is an inhabitant of the swampy inlets and boggy margins of the enclosed lakes, and here the imagoes may be found coursing up and down over the water or the bog, with the abdomen tilted up in a peculiar way, or sunning themselves upon the leaves along the shore.

Epicordulia princeps, (Hag.) is a species of more southern distribution and hence more often seen in collections. It is peculiar among Cordulines in having the wings spotted after the manner of some of the common Libellulae, but is readily distinguished from these on the wing for it is a much more restless insect, flying ceaselessly over the larger bodies of water often at considerable heights, but also common enough in the rocky open woods some distance from the shore. It was a very characteristic species about Go Home Bay from the last week in June until about the middle of August.

The largest and most striking of all the dragon-flies of the region, however, has not yet been mentioned. This is a great black and greenish-yellow Gomphine, *Hagenius brevistylus*, (Selys.) which suddenly appeared on the Station island and elsewhere in considerable numbers. Its great size, striking coloration and the peculiar way in which the abdomen is curved downward in flight renders it a formidable-looking insect on the wing, while its nymph is a most gorgeous creature very different in appearance from other Gomphines. It is a large flat brown insect with a nearly circular abdomen looking more like a gigantic bed-bug than anything else. They live among the roots and debris along the lower and more sheltered parts of the shore, always, however, where there is considerable wave-action or current. The few nymphs we found before their time for transformation began died in confinement, the water in which they were kept not having been sufficiently well aërated.

Numerous other dragon-flies were taken and the nature of their breeding places more or less definitely determined, but time does not permit me to mention more than a few of these.

The greatest rarity was *Nasiaeschna pentacantha* (Ram.) of which probably less than twenty specimens exist in collections, although it is distributed as far south as Texas and has been known a long time. Last year Mr. Fraser obtained three specimens of its peculiar nymph near Bala, Muskoka. This is a large sluggish dark-brown creature of apparently similar habits to those of *Hagenius* but entirely different in appearance. This summer I accidently found a nymph clinging to my paddle while passing through a short channel which leads into one of the small lakes. Further search for nymphs proved fruitless but a few days afterwards a few imagoes were seen on the wing over a marsh on the border of the same lake, but were too wary to be netted. About a week later, however, I chanced upon a similar spot in another locality and managed to net a fine male, and this was the only one taken as the season was apparently about over.

Another somewhat rare species and a very odd and interesting little one is *Nannothemis bella* (Uhl.) Fig. 8. This is a very tiny dragon-fly, though it belongs to the Libellulidae which are mostly large forms, whereas all the rest of our very small species belong to the Agrionidae or Damsel-flies. The male, which is at first perfectly black, very soon becomes covered with a bluish dust, while the female is black with transverse bands of yellow. It was only found in two places but at one of these it was exceedingly abundant. This was a small floating sphagnum bog occupying one corner of an enclosed lake and having an area of scarcely 50 square yards. Here they were flying about among the grass and bog plants close to the ground and when perching had the peculiar habit of folding the wings downwards on each side of the stalk which formed their support. This spot was a veritable little garden of orchids and other interesting plants. Over the sphagnum moss the cranberry vines trailed in the greatest profusion, while pitcher-plants, sundews of two kinds, the delicate rose-colored orchids, *Pogonia ophioglossoides* and *Limodorum tuberosum*, and the tufts of white cotton-grass were a most charming spectacle. It is among the roots of the cranberry-vines and sphagnum that the nymphs of *Nannothemis* live, these being well immersed in water. We could not find any, however, and two exuviae were the only reward of a most careful search. This bog and others of the same kind were the home of many other dragon-flies, but I shall make mention of only two or three of the Damsel-flies or Agrionidae (Fig. 7), a large group which I have as yet scarcely alluded to. Some 18 species were taken in the vicinity of Go Home Bay, two of which were new to Canada. These Agrionids are the small delicate forms that flit about in such large numbers among the grass and sedge about the margins of lakes and streams. One of the smallest of our species *Nehallennia gracilis*, Morse, and a new addition to the Canadian fauna, we found in vast numbers in every sphagnum bog. It is an exceedingly delicate little bronze-green insect, the under parts yellowish-green and the end of the abdomen beautifully tipped with pale blue, and very closely resembles the common species *N. irene*, which, however, has different haunts, preferring the shallow marshy inlets of the bay to the bogs of the small lakes.

The most familiar members of this group, however, are the beautiful little azure-blue *Enallagmas* and the larger, dark metallic-green forms with broad black or banded wings belonging to the genus *Calopteryx*. *Enallagma* was abundantly represented by 8 species, but *Calopteryx* of which *C. maculata* is familiar to every collector was exceedingly rare, it being a frequenter of woodland streams of which there were very few in the district.

Lestes is another large genus of this group and was conspicuously represented at Go Home, the large and graceful *L. vigilax* being particularly numerous in all marshy places. These forms are slender, graceful insects, generally bronze in color and are easily recognized in the field by the listless way they have of resting upon a grass stem or reed with the wings half spread. Other Agrionids keep their wings folded together over the back, while in the rest of the dragon-flies they are held in a horizontal position.

These *Lestes* are among the later dragon-flies to appear and are common until well on in September, when almost the only other survivors of the group are the *Aeschnas* and the various species of *Sympetrum*, those hardy little red fellows which are so abundant in late summer and fall. The dragon-fly season, in fact, begins to wane before the end of July, though a host of forms are still abroad in August and several species do not appear until the month has begun. We have, however, dealt with a sufficient number to indicate the nature of this part of our summer's work at the station and the character of the fauna in that region. Fifty-eight species were taken and the nymphs or nymph exuviae of nearly half that number, and it is to be hoped that the work will be continued year by year until the life histories are known not only of the dragon-flies but of all the aquatic insects of the region.

A PRELIMINARY LIST OF THE SCALE INSECTS OF ONTARIO.

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The following list of 48 species is certainly not a complete one for our province, but may serve as a basis for further work by other collectors. Twenty-eight of these are found on forest trees, 8 on fruit trees, 10 on shrubs, 9 on greenhouse plants, 2 on weeds, 2 on staple crops, and 1 in nest of ants.

I am deeply indebted to Prof. J. G. Sanders and Prof. C. L. Marlatt, Bureau of Entomology, Washington, for identification of many of the species. I owe thanks to Mr. L. Caesar for his assistance in describing many of the insects. To the following, also, my gracious acknowledgment is due for assistance in various ways: Dr. Bethune, O. A. College; Dr. Fletcher, Dominion Experimental Farm, Ottawa; Prof. C. C. James, Thomas Rivett and Percy Hodgetts, Department of Agriculture, Toronto. Many of the illustrations are after Lochhead (the San José Scale and other scale insects).

Ortheziinæ.

(Arranged according to a Catalogue of Coccidæ of the World, by Mrs. Fernald.)

90 Orthezia Americana, (Walk)—Artemisia sp., Woodstock.
98 Orthezia insignis, (Dougl.)—Palm, Greenhouse, Toronto.

Dactylopiinæ.

192 Asterolecanium variolosum, (Ratz.)—Oak, (Quercus sp.)—Niagara, Ottawa.
254 Kermes Pettiti, (Ehrh.)—White Oak (Quercus alba), Toronto.

255 Kermes pubescens, (Bogue)—Bur Oak (Quercus macrocarpa)—Guelph, Perth, Toronto.
279 Gossyparia spuria, (Modeer)—American Elm (Ulmus americana)—Toronto.
391 Phenacoccus aceris, (Sign.)—Soft Maple (Acer saccharinum), Amherstburg, Ont.
401 Phenacoccus Dearnessi, (King)—Hawthorn (Cratægus sp.), London.
454 Pseudococcus citri, (Risso)—Many species of plants, greenhouse, Ont.
490 Pseudococcus longispinus, (Targ.)—Many species of plants, greenhouse, Ont.
529 Pseudococcus trifolii, (Forbes)—Clover roots (Trifolium repens)—Collingwood.
572 Ripersia lasii, (Ckll.)—Nests of ants, Toronto.
699 Pulvinaria vitis (L.), (Rathvon)—Acer sp., Salix sp., Ilex verticillata, Cratægus sp., Tilia americana, Viburnum pubescens, Western Ontario.
661 Pulvinaria floccifera, (Westwood)—Brassia sp., greenhouse, Ottawa
848 Coccus hesperidum, (Linn.)—many species of greenhouse plants, greenhouse, Ont.
860 Coccus pseudohesperidum, (Ckll.)—Cattleya, greenhouse, Guelph, Ottawa.
959 Eulecanium quercifex, (Fitch.)—Red Oak (Quercus rubra), Jubilee Point, Lake Ontario.
918 Eulecanium caryæ, (Fitch)—Am. Elm (Ulmus americana); Hawthorn (Cratægus sp.)—Guelph, St. Catharines.
921 Eulecanium cerasifex, (Fitch)—trees, shrubs and vines of all kinds. All parts of settled Ontario.
935 Eulecanium Fletcheri, (Ckll.)—White Cedar (Thuja occidentalis), Guelph, Ottawa.
950 Eulecanium nigrofasciatum, (Perg.)—Soft Maple (Acer saccharinum), St. Catharines, Walkerville.
902 Toumeyella pini, (King)—Austrian Pine (Pinus Austriaca), London.
Toumeyella liriodendri, (Gmel.)—Tilia Americana, Ottawa.

Diaspinæ.

1036 Chionaspis Americana, (Johnson).
1055 Chionaspis furfura, (Fitch)—Pyrus, Cratægus, Ontario.
1062 Chionaspis Lintneri, (Comst.)—Alder (Alnus incana), Dogwood (Cornus stolonifera), London, Guelph, Rondeau, Ottawa.
1073 Chionaspis pinifoliæ, (Fitch)—Pinus and Picea, Ontario.
1081 Chionaspis salicis, (Linn.)—Leatherwood (Dirca palustris), White Ash, (Fraxinus americana), Guelph.
1096 Aulacaspis Boisduvalii, (Sign.)—Palm, greenhouse, Guelph.
1127 Aulacaspis rosæ, (Bouche)—Rose, Raspberry, etc., Ontario.
1143 Hemichionaspis aspidistræ, (Sign.)—Pteris serrulata, Ottawa.
1199 Aspidiotus æsculi, (Johnson)—Tilia americana, Toronto, Brantford, Guelph.
1200 Aspidiotus ancylus. (Putn.)—Weeping Willow, Am. Elm, Belleville, Ottawa, Toronto, St. Catharines.
1220 Aspidiotus diffinis, (Newst.)—Basswood (Tilia americana), Guilds.
1229 Aspidiotus Forbesi, (Johnson)—Beech, Fragrant Currant, Apple, Plum and Hawthorn—London, Ottawa, Niagara District.
1233 Aspidiotus hederæ, (Vall.)—Oleander, etc., greenhouse, Ontario.
1239 Aspidiotus juglans-regiæ, (Comst.)—Apple, Willow, Cottonwood, Niagara, Collingwood.

1250 Aspidiotus Osborni, (Newell and Ckll.)—Quercus alba, Betula lutea—Guelph, Toronto.
1252 Aspidiotus ostreæformis, (Curt.)—Apple, Pyrus, Maple, (Acer saccharinum, Hawthorn, Ontario.
1256 Aspidiotus perniciosus, (Comst.)—Apple, Pear and many shade trees—Niagara district, London, Aylmer, Essex district.
1270 Aspidiotus ulmi, (Johnson)—Ulmus americana—Guelph, Toronto.
1300 Chrysomphalus dictyospermi, (Morg.)—Cinnamon, greenhouse, Ottawa.
1305 Chrysomphalus obscurus, (Comst.)
1330 Targionia Dearnessi, (Ckll.)—Arcostaphylos uva-ursi, Bruce Peninsula, Shores of Lake Huron.
1377 Lepidosaphes Beckii, (Newm.)—imported oranges and lemons.
1431 Lepidosaphes ulmi, (Linn.)—many species of trees, Ontario.
1442 Parlatoria Pergandei, var. theæ, (Comst.)—lemon, O.A.C. greenhouse.

The San José Scale, *Aspidiotus perniciosus*, (Comst.), figs. 10-14.

Wherever it occurs the San José Scale is considered, and rightly so, the most destructive insect that fruit growers have to combat. Fortunately for us, however, in Ontario it is confined to the south-western portion of the province.

The mature female scale is small, circular, 1-2 mm. in diameter, only slightly convex, grayish brown in color except the central part, which is often of a lighter shade, being usually a light yellowish-brown color. The exuviæ or larval skin is centrally situated, or nearly so. The surface is fairly smooth. Sometimes a sooty fungus (*Fumago salicina*) darkens the color of the scale.

The male scale is much smaller and different in shape. It is oblong instead of circular, and about twice as long as broad, but the total length is only about half the diameter of the female. The exuvial part is not central, but situated near one end. The color as a rule is considerably darker than that of the adult female.

The usual appearance of the wintering stage of the female scale is different from the summer form, being very small, almost black and circular, with exuvial part central. There is a distinct nipple with a ring or depression around it.

There are four other Aspidiotus scales found in Ontario which are very difficult to distinguish from the San José scale. The particular points of difference between each of these and the San José scale will be discussed as these scales are respectively taken up. It should be noted, however, that if one takes his knife and cuts off a slice from a twig or branch affected with San José scale the cambium and some of the sap-wood just beneath the bark will be seen to be colored purple. This purplish color is very often seen also on the surface of the bark, and on the fruit around where the scale is situated.

Though the scale insects are in all stages when winter comes on, yet by far the majority of the females are of the type described above under the heading of the wintering stage. In the spring, about the end of May, though this year not until the middle of June, the winged males come forth and fertilize these half-grown females. About a month after this, the latter begin to give birth to living young. About eight or ten young are born in a day as a rule, and a single female continues to reproduce at this rate for about six weeks, when she dies. A young female takes about forty days to mature and then in turn begins to produce living young. In this way we find that all stages of the insects are to be found all through the summer until the frost stops the reproduction. So very prolific is the insect that it has been calculated that if every scale were to live and mature, 3,000,000,000 individuals could be traced back to a single fertilized female in one summer. Hence it

is easy to understand why the scale so quickly destroys infested trees. It is usually found that if no steps are taken to check the pest, it will kill young thrifty trees in three years.

Almost any kind of fruit trees and bush fruits are liable to be attacked by the scale. Many shade and forest trees are also attacked.

Remedies.

(1) There is one great standard remedy that has given good satisfaction whenever carefully made and thoroughly applied, namely, the lime-sulphur wash. This should be put on in the spring, or in badly infested orchards it will pay to give the trees a double dose, one in autumn as soon as the leaves fall and the other in the spring before the buds have burst.

(2) Kerosene emulsion, whale oil soap, and a number of other ready-made oil washes, like Scalescide, give fairly good results. They have not, however, been found to be so reliable as the lime-sulphur wash, and in addition are much more expensive.

Before any tree is sprayed it should be carefully pruned and the branches thus removed should be burned.

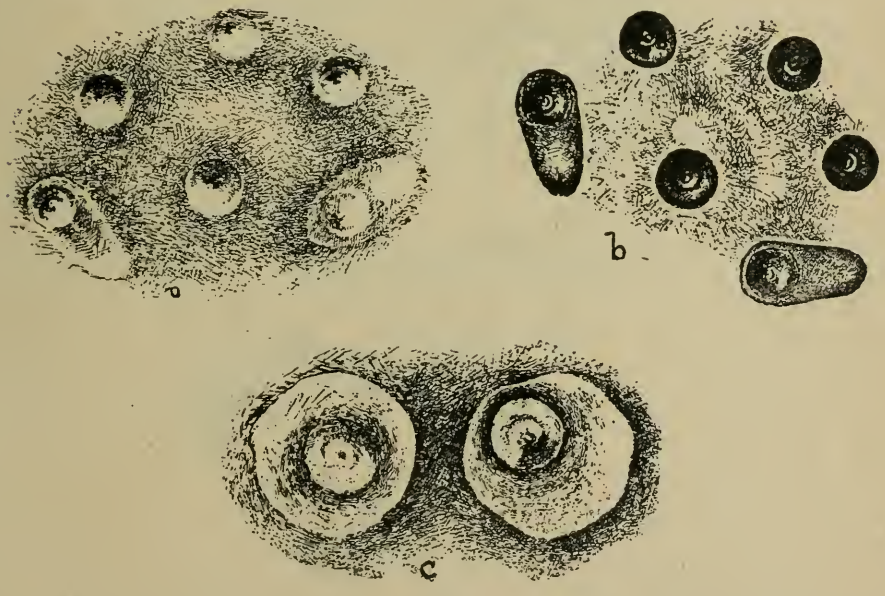

Fig. 10. San José Scale (*Aspidiotus perniciosus*). (*a*) Four young scales and two male scales, showing the nipple and ring even in the very young forms; (*b*) four immature female scales, and two nearly grown male scales, showing the prominent nipple and circular groove about the nipple, of the black scales; (*c*) two small female gray scales, showing the central nipple and circular groove. One scale has a nipple not central. The body of insect is beneath the scale.

Parasites.

(1) Two small Chalcid flies, *Aphelinus mytilaspidis* (Le Baron), and *Aphelinus fuscipennis*, (How.)

(2) Two ladybird beetles, *Pentilia misella*, (Lec.), fig. 15, and *Chilocorus bivulnerus*, (Muls.)

(3) In some districts a fungus ,*Sphærostilba coccophila*. It is difficult to say whether the latter is at work in Ontario.

Note.—At the 1906 meeting of the Entomological Society of Ontario, I gave observations on a scale insect, which I thought to be the San José scale, in gardens at Toronto. Since that time I have made a more careful microscopic examination, and find it to be *Aspidiotus ostreæformis* or Curtis scale. The bark around the scale was pink, much like the appearance of the San José scale infested bark.

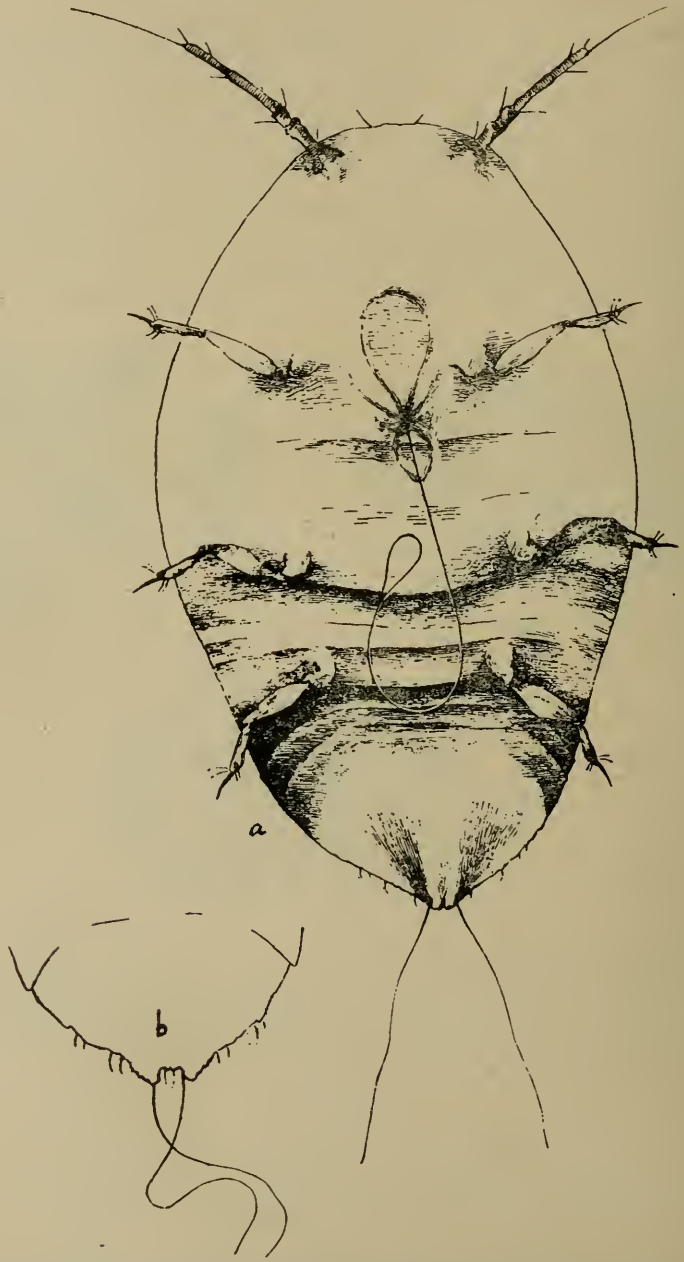

FIG. 11. San José Scale larva, the active crawling form, showing the two feelers, six legs, and long sucking tube; (*b*) enlarged drawing of anal plate.

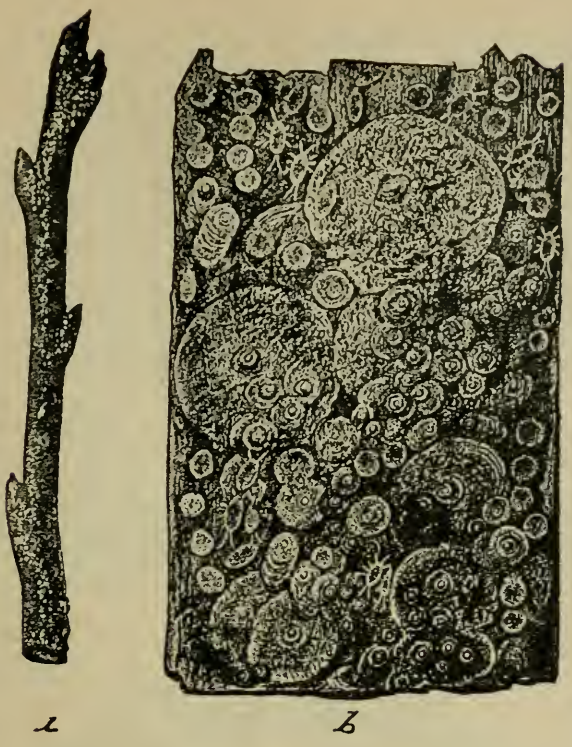

Fig. 12. A portion of branch covered with San José Scale. Appearance of scale on bark; (*a*) infested twig, natural size; (*b*) bark as it appears under hand lens, showing scales in various stages of development and young larvæ.

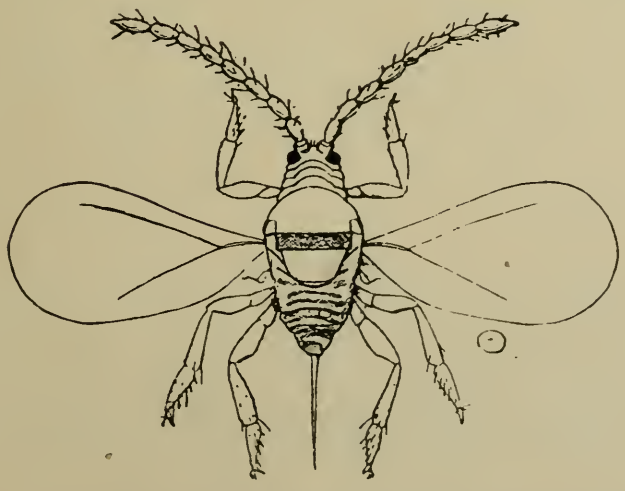

Fig. 13. Adult male insect of San José Scale, escaped from covering scale, showing the two wings, two feelers, two eyes, six legs, and long anal style. (Div. Ent. U.S. Dept. Ag.)

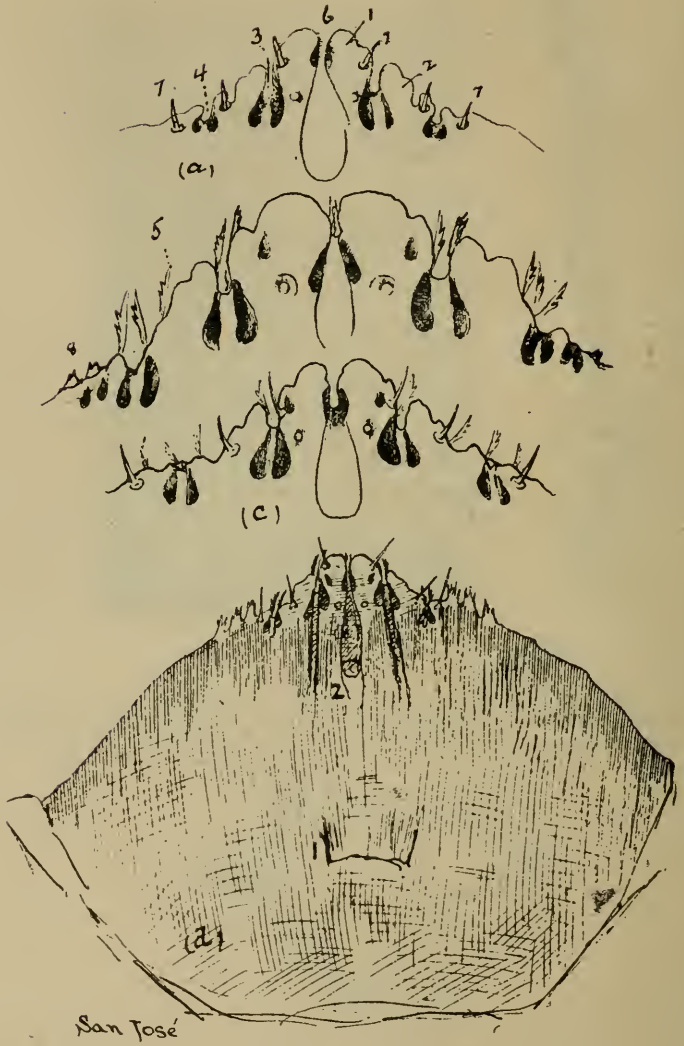

FIG. 14. Anal plates of female San José Scale. (*a*) Anal plate, showing median lobe (1), second lobes (2); incisions (6), (3), (4); chitinous thickenings on each margin of these incisions, and the spines (7) on each of the lobes. (The plates have not been drawn in this case). (*b*) Anal plate, showing the lobes, incisions, thickenings, and plates (5) a pair of plates between median lobes, a pair at first incision, and three at second incision. Notice the large size of second lobe, which is notched once on the margin. (Spines have not been drawn). (*c*) Anal plate, showing both spines and plates. Notice the chitinous thickenings between the median and second lobes are nearly equal in size and close together. (*d*) Anal plate and last segment of adult female. There are no ventral glands. (1) Vaginal opening; (2) anal opening.

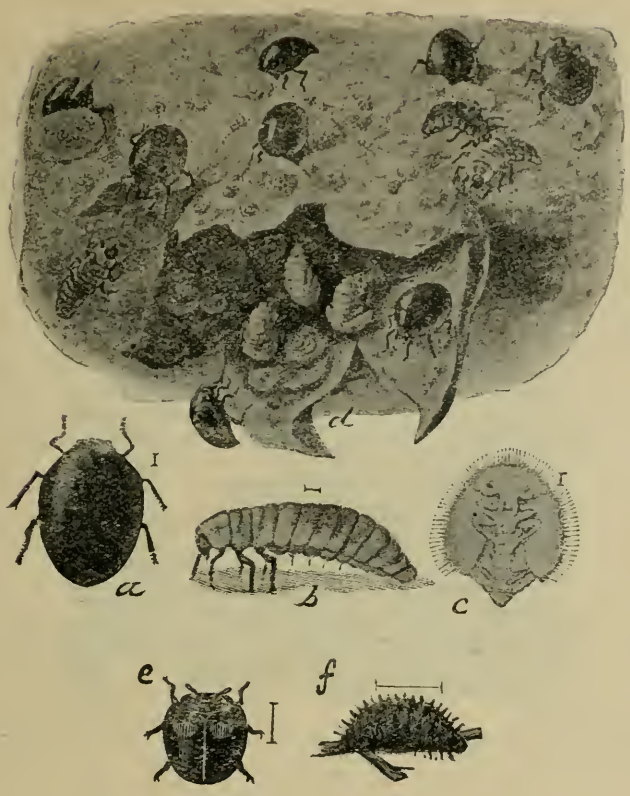

Fig. 15. Two enemies of the San José Scale. (*a*) Beetle; (*b*) larva; (*c*) pupa of Pitiful Lady-beetle (*Pentilia misella*); (*d*) blossom end of pear, showing scales with larva and beetles feeding on them; (*e*) Twice-stabbed Lady-beetle (*Chilocorus bivulnerus*); (*f*) its larva. (*a*, *b*, *c* and *d* after Howard, & Marlatt, *e* and *f* after Riley).

Curtis scale (*Aspidiotus ostreæformis* Figs. 16-18.

This scale is much more widely distributed throughout Ontario than has been hitherto supposed, but in spite of its prevalence, it does not seem to be very destructive.

The adult female resembles the San José in being circular and having the exuviæ centrally situated as a rule, though with many exceptions. It differs, however, in several important particulars: (1) It is considerably larger, averaging about 2 mm. in diameter, whereas the San José averages about 1.4 mm. (2) It is much more convex. (3) A smaller proportion of the exuvial part is light colored, in fact only the nipple, whereas a considerable part of the central portion of the San José was lighter than the general color of the scale. (4) There is a light or whitish colored margin to be seen around the outside of most of the scales. (5) The surface is rougher. (6) The usual winter form is not nearly black like the San José but is a whitish brown, and has no ring or depression around a distinct nipple.

This scale passes the winter in mature condition for the most part. It matures about the end of June. Like the San José it brings forth living young which continue to be produced throughout nearly all of July. There is, however, only one generation in a year.

The scale has been reported to us or found by us in very many places in Collingwood on the west to Trenton in the east.

Its chief food plants in Ontario seem to be the apple and pear. It is said, however, to attack also the plum, cherry, currant, mountain ash, elm, basswood, Carolina poplar, and willow.

Natural enemies:

(1) A white fungus, commonly attacks it at Guelph. See Plate D.

(2) A few of the scales were perforated in a manner characteristic of Chalcid flies, so that it is probably attacked by one of these tiny parasites.

Remedies:

Scrape the rough bark off the trunks of trees and use the same remedies as for San José scale.

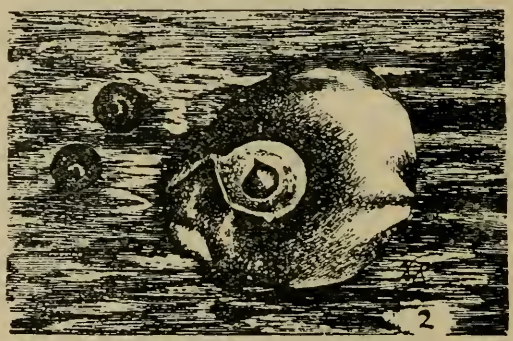

FIG. 16. Curtis Scale (*Aspidiotus ostreæformis*), greatly magnified.

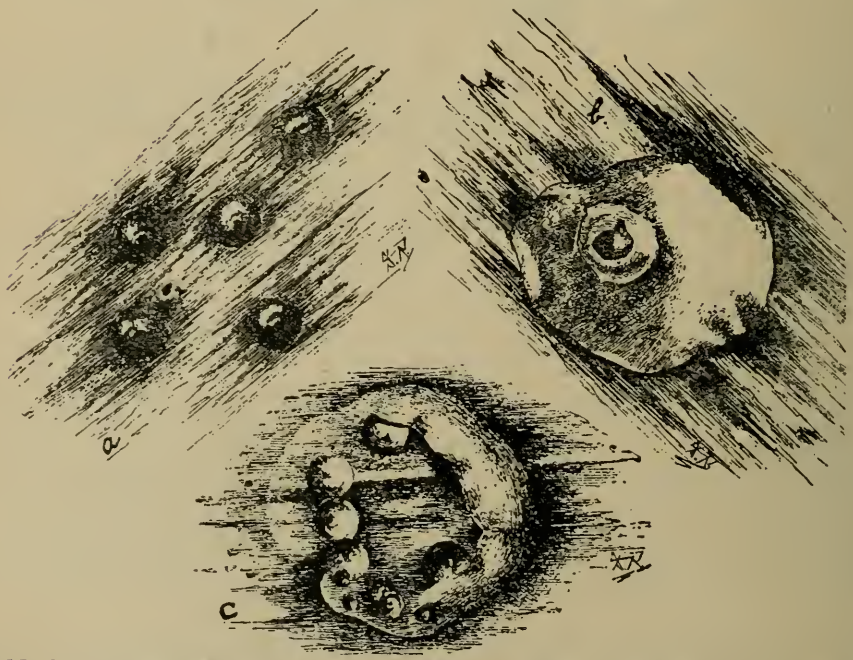

FIG. 17. Curtis Scale (*Aspidiotus ostreæformis*). (*a*) Young scales which are not nearly full-grown; the nipple is plain, but the circular grove about it is wanting; (*b*) Full-grown pregnant female; the nipple is large; (*c*) old scale with several young scales hidden beneath it—a characteristic feature.

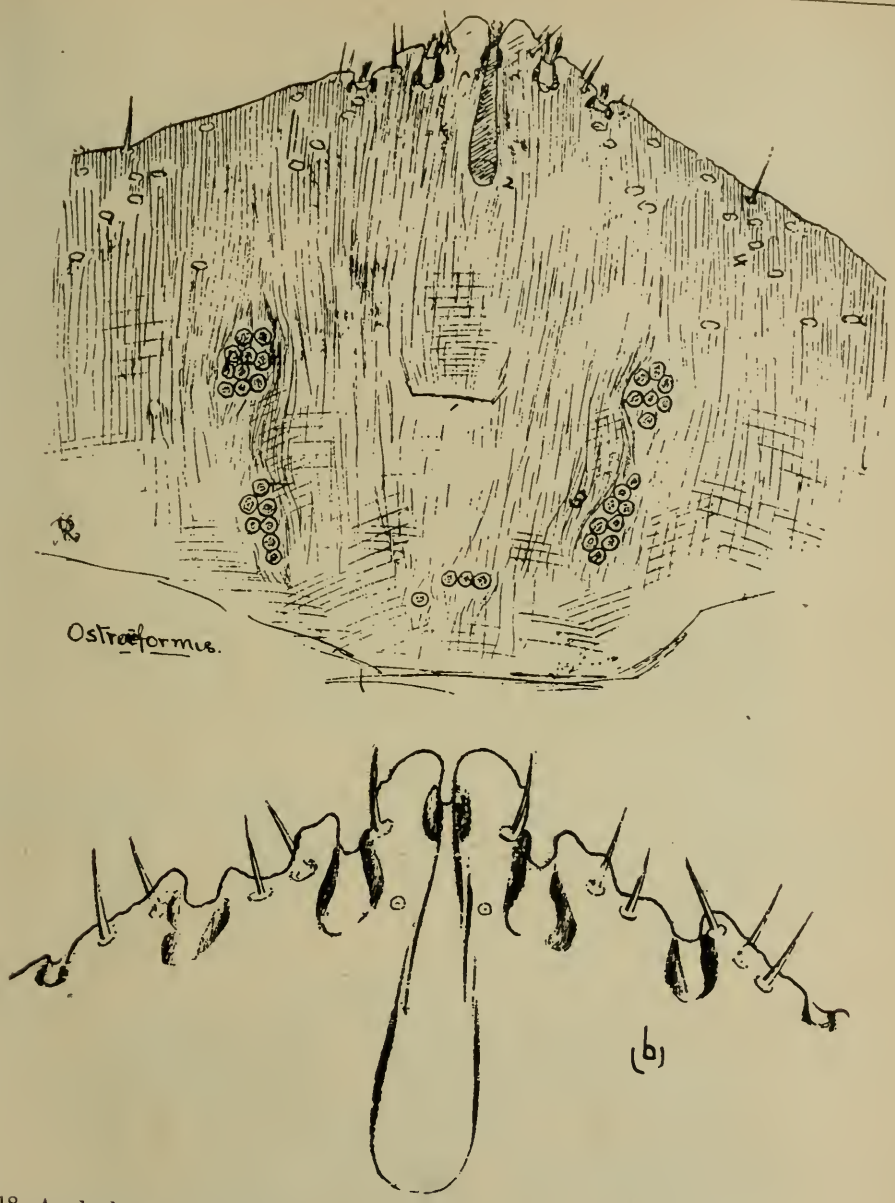

FIG. 18. Anal plate of Ostreæform or Curtis Scale, showing lobes, incisions, thickenings, and spines. The inner angles of second lobe are decidedly developed; outer lateral margin of second lobe undulating; chitinous processes of first incision long and nearly equal in size; (*b*) anal plate much enlarged.

The Cherry Scale, *Aspidiotus Forbesi* (Johnson). Figs. 19 and 20.

The Cherry Scale, although found in several localities in Ontario, has not yet, with one or two exceptions, been reported as doing much damage.

The adult female scale is circular, nearly smooth, slightly convex, about 1.3-1.5 mm. in diameter, and has the exuviæ usually centrally situated. The general color varies from a yellowish brown to a greyish yellow. The exuvial part is usually orange.

The adult female scale is very difficult to distinguish from the San José. The San José, however, has the exuviæ light brown, the Cherry has orange exuviæ. The immature San José scales are often dark and have a distinct nipple, with a ring or depression around it; the immature Cherry scales are much the same color as the mature scales and there is not the same prominent nipple and encircling ring. Furthermore the San José scale discolors the fruit, bark and cambium layer, the Cherry scale does not.

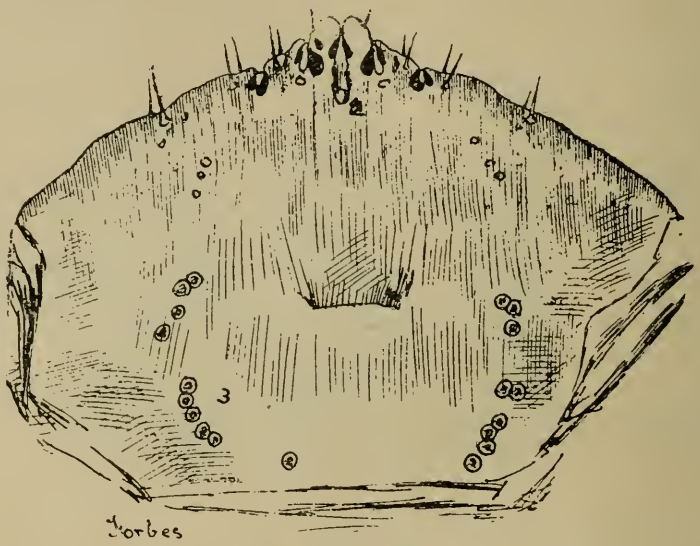

Fig. 10. Anal plate of Forbes Scale, showing lobes, incisions, thickenings, and spines; also anal opening (2), vaginal opening (1), and ventral glands (3). Notice that the median lobes approximate at apex, and that the inner thickening at first incision is very large and club-shaped.

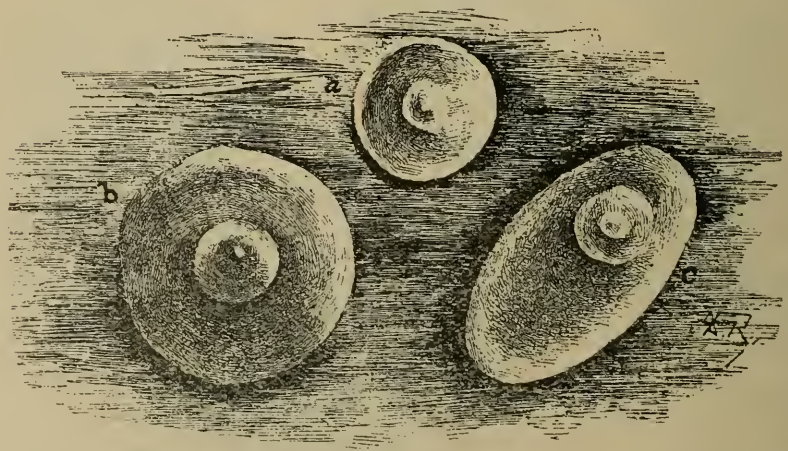

Fig. 20. Forbes or Cherry Scale. (*a*) Young scale, light colored, with central nipple but no circular groove; (*b*) adult female scale with central or nearly central, orange-colored nipple, and gray outer margin of scale; (*c*) male scale, showing the oval shape, and nipple near one end. The body of the insect is under the scale.

The life history of this scale is said to be as follows: It passes the winter in a partly grown stage. The males emerge about the end of April. In May the young begin to come forth and eggs and young may both be found up to about July. There are two broods in some of the American States, but whether there is more than one in Ontario has not yet been discovered.

The Cherry scale has been found in Ontario at Ottawa, London, St. Catharines, Grimsby, and in Prince Edward county.

The host plants so far discovered are cherry, apple, hawthorn, fragrant currant, and beech.

Remedies:

The same remedies should be used as for the San José scale.

Natural Enemies:

Several species of Chalcid flies are said to attack it, also a tiny white mite, and the twice-stabbed ladybird beetle (*Chilocorus bivulnerus*, Muls.)

The English Walnut Scale (*Aspidiotus juglans-regiæ*, Comst.) Figs. 21 and 22.

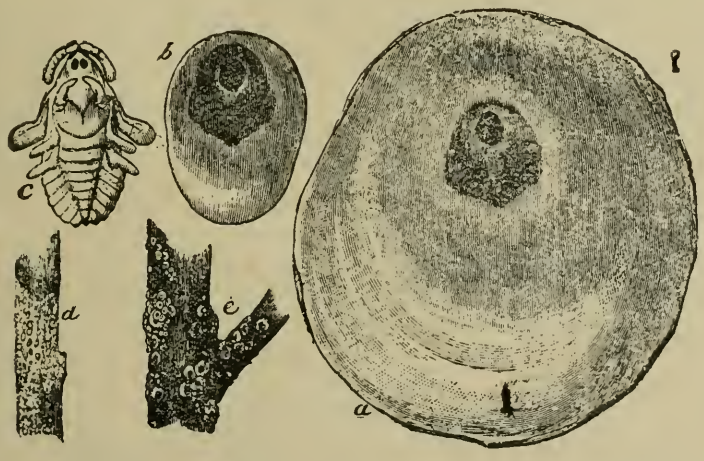

Fig. 21. The English Walnut Scale (*Aspiodiotus juglans-regiæ*). (*a*) Female scale; (*b*) male scale; (*c*) male chrysalis; (*d*) male scales on twig; (*e*) female scales on twig. *a*, *b*, *c*, enlarged; *d*, *e*, natural size. After Howard. From U.S. Dep. Agr., Year Book for 1894.

Fig. 22. Anal plate of English Walnut Scale, showing the large median lobes, and notched outer margin of second lobe.

The English Walnut scale has been found in Ontario in only two or three localities, although it probably exists in several others. If some sam-

ples from Collingwood, sent by this department to Washington, and thought by the authorities there to belong to this species, should prove to be really such, the scale is capable of doing great injury to the trees it attacks. The poplars and willows at Collingwood on which it was found were very thickly covered, and were dying, apparently from the effects of the scale.

The adult female scale is larger than any other species of Aspidiotus described in this paper, averaging almost 3 mm. in diameter. It is circular or nearly circular in outline, very flat for its size, resembles closely the color of the bark it is on, being usually a pale grayish brown. The exuviæ are usually eccentric and are orange or reddish in color, though often this color is partly concealed by a waxy secretion.

Though the adult female of this scale is easily distinguished from the San José by its large size and reddish eccentric exuviæ, yet the winter stage of some specimens we have received is with great difficulty distinguished from the winter stage of the San José. The chief points of distinction seem to be: (1) The winter stage of the Walnut scale is a little larger than that of the San José; (2) Even in these winter scales, the reddish exuviæ can often be seen with the aid of a lens although a waxy secretion almost conceals it. In the San José scale this reddish color does not appear.

We have very little knowledge of the life-history of this scale. From specimens we have seen this autumn it seems to pass the winter for the most part in an immature stage. It does not bring forth its young alive but lays eggs. There is probably more than one brood in a season.

The scale has been found only at Grimsby and Collingwood (?)

The host plants so far discovered in Ontario are apple, willow and poplar.

Remedies:

The same remedies should be used as for the San José scale.

We have not been able to observe what natural enemies this scale has.

The Putnam Scale, *Aspidiotus ancylus*, (Put.) Fig. 23.

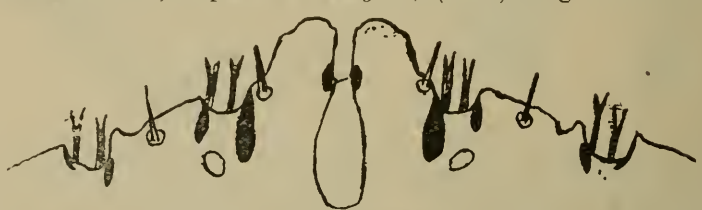

Fig. 23. Anal plate of the Putnam Scale, showing the unequal thickenings in first incision, the rudimentary second lobe, and the wide interval between median and second lobes.

The Putnam scale is distributed fairly widely throughout Ontario. It has not, however, been known to do much damage in the province although in some of the states across the boundary it is said to have been quite destructive.

The adult female scale is usually more nearly oblong than circular, about 1.5 mm. long, 1-1.3 mm. wide, and slightly convex. The general color is greyish black, varying somewhat with the color of the bark it is on. The exuvial part is eccentric and practically always red or reddish. Sometimes this red color is obscured by a whitish film which can easily be rubbed off.

This scale can be easily distinguished from the San José by its oblong shape and the red eccentric exuviæ. It has the peculiarity of producing in a small degree the purplish color so characteristic of the San José scale.

It passes the winter in a nearly full grown stage. The males begin to appear, it is said, in May. In late spring or early in summer the female lays from 30 to 40 eggs. These hatch in July. There is only one brood in a season.

The scale has been reported from Ottawa, Toronto, Belleville, St. Catharines, and Kingsville.

It has been found on plum, elm, and willow in Ontario, but is said to attack also cherry, apple, red currant, maple, oak, ash, and beech.

Remedies:

The same remedies should be used for this scale as for San José.

Parasites:

The only parasite we have heard of as attacking it is a minute Chalcid fly, *Coccophagus varicornis*, (How.)

Osborn's Scale (*Aspidiotus Osborni*).

Osborn's scale is found on forest trees in northern and western Ontario.

The mature female is about the same size as the Curtis scale, averaging about 2 mm. in diameter. It is very smooth and circular, and the exuviæ is eccentric. The general color is brown, varying somewhat with the color of the bark of the host; under the loose bark of the paper birch the color is gray.

It has been found on paper birch, yellow birch, cottonwood, and white oak.

It passes the winter in a nearly full grown stage.

Parasites:

The work of Chalcis flies have been found on several occasions.

The New York Plum Scale, *Eulecanium cerasifex* (Fitch.) Fig. 24.

The New York Plum Scale has become one of our most common scales and like the Oyster-shell scale has spread over practically the whole province. Though not so destructive as the Oyster-shell, it is often quite injurious where abundant and sometimes kills the infested tree.

The scale is one of our largest species. The mature female is nearly hemispherical, but usually a little longer than broad, being 3-5 mm. and 2.5-4 mm. wide. It varies in color from light brown to almost black. The surface is usually glossy with, however, numerous little depressions and elevations which sometimes take the form of grooves and ridges radiating from the apex to the base.

The male scale is very unlike the female in shape, size and color. It is elongated in form, 2-2.5 mm. long, and 1 mm. wide, only slightly convex, and is grayish white in color. Both male and female scales are found near each other on the same branch.

The winter is passed by both sexes in the half-grown stage. The winged males appear June 1st (this year, 1907, it was June 12th), and soon after this the females lay their eggs and die, but their dead body still remains as a cover for the egg mass. About the end of June (this year on July 19th), the eggs begin to hatch out. There are sometimes about 1,000 eggs laid by a single scale. The young scales move from the branches to the leaves where they remain until autumn and then migrate back to the branches for the winter. There is only one generation in a year.

We have found this scale on a great range of trees and other plants at Guelph, the following being the list as observed up to date of writing:— apple, plum, pear, mountain ash, hawthorn, currants, gooseberry, wild red

raspberry, wild black currant, wild grape, Virginia creeper, elder, red-osier dogwood, mountain maple, black maple, silver maple, white ash, black ash, beech, blue beech, ironwood, basswood, alder (Alnus incana), poplar (Populus alba), rock elm, American elm, prickly ash, butternut, black walnut, catalpa, hazel-nut, pin-cherry, bur oak, English oak (*Quercus robur*), sweet hickory, and many species of herbs near infested trees.

Remedies:

(1) The lime sulphur spray. This must be very carefully put on as the scales for the most part in fall, winter, and spring, are to be found on the lower side of the branches.

(2) Kerosene emulsion, applied when the tree is dormant, preferably as soon as the leaves fall in autumn. Dilute the stock emulsion with four parts of water.

(3) Kerosene emulsion, flour kerosene, or whale-oil soap at ordinary strength applied as soon as eggs have hatched, which must be determined by actual observation each year.

FIG. 24. Twig of plum infested with Lecanium or New York Plum Scale. (*a*) The old scale of the previous summer empty and lifeless; (*b*) the immature wintering scales, which will become full grown like (*a*) next June.

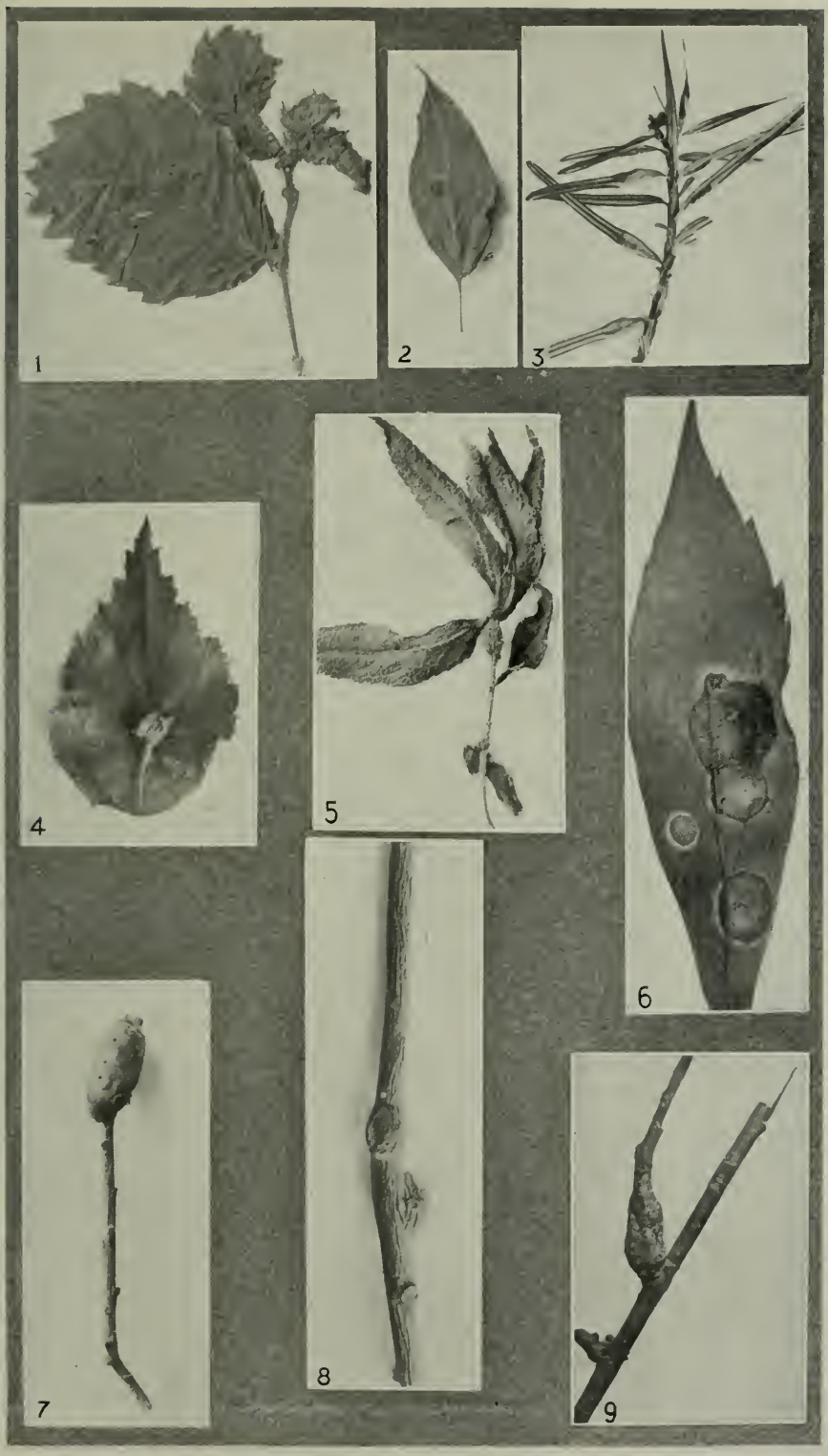

PLATE A.

1. Cecidomyia ulmi, Beuten.
2. Lasioptera corni, Felt.
3. Cecidomyia balsamifera, Lintner.
4. Hormomyia cratægifolia, Felt.
5. Choristoneura perfoliata, Felt.
6. Choristoneura flavolunata, Felt.
7. Rhabdophaga batatas, O.S.
8. Agromyza æneiventris, Fallen.
9. Rhabdophaga nodulus, Walsh.

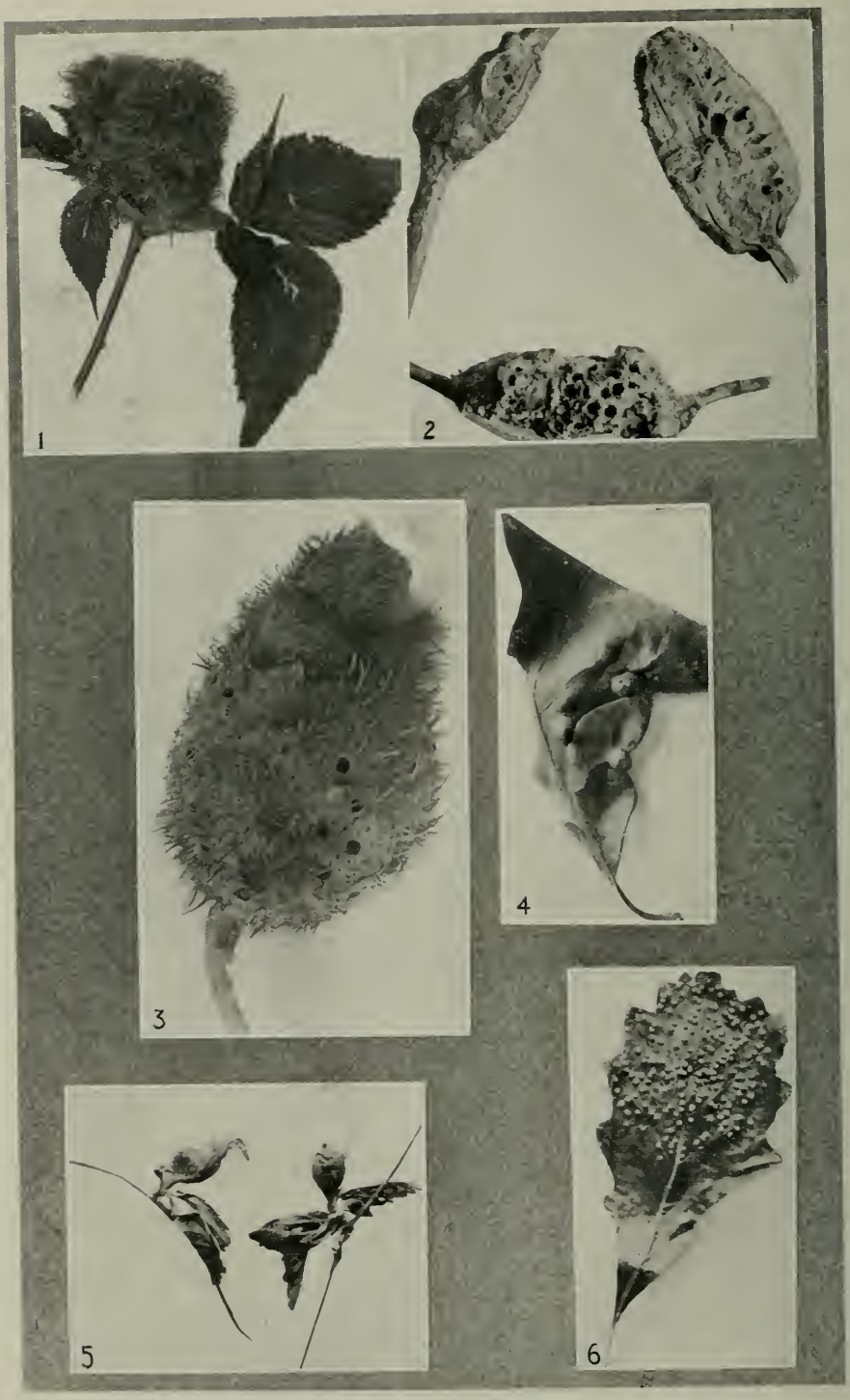

PLATE B.

1. Rhodites sp. on Blackberry.
2. Diastrophus turgidus, Bass.
3. Rhodites multispinosus, Gill.
4. Andricus futilis, O.S.
5. Diastrophus potentillæ, Bass.
6. Neuroterus umbilicatus, Bass.

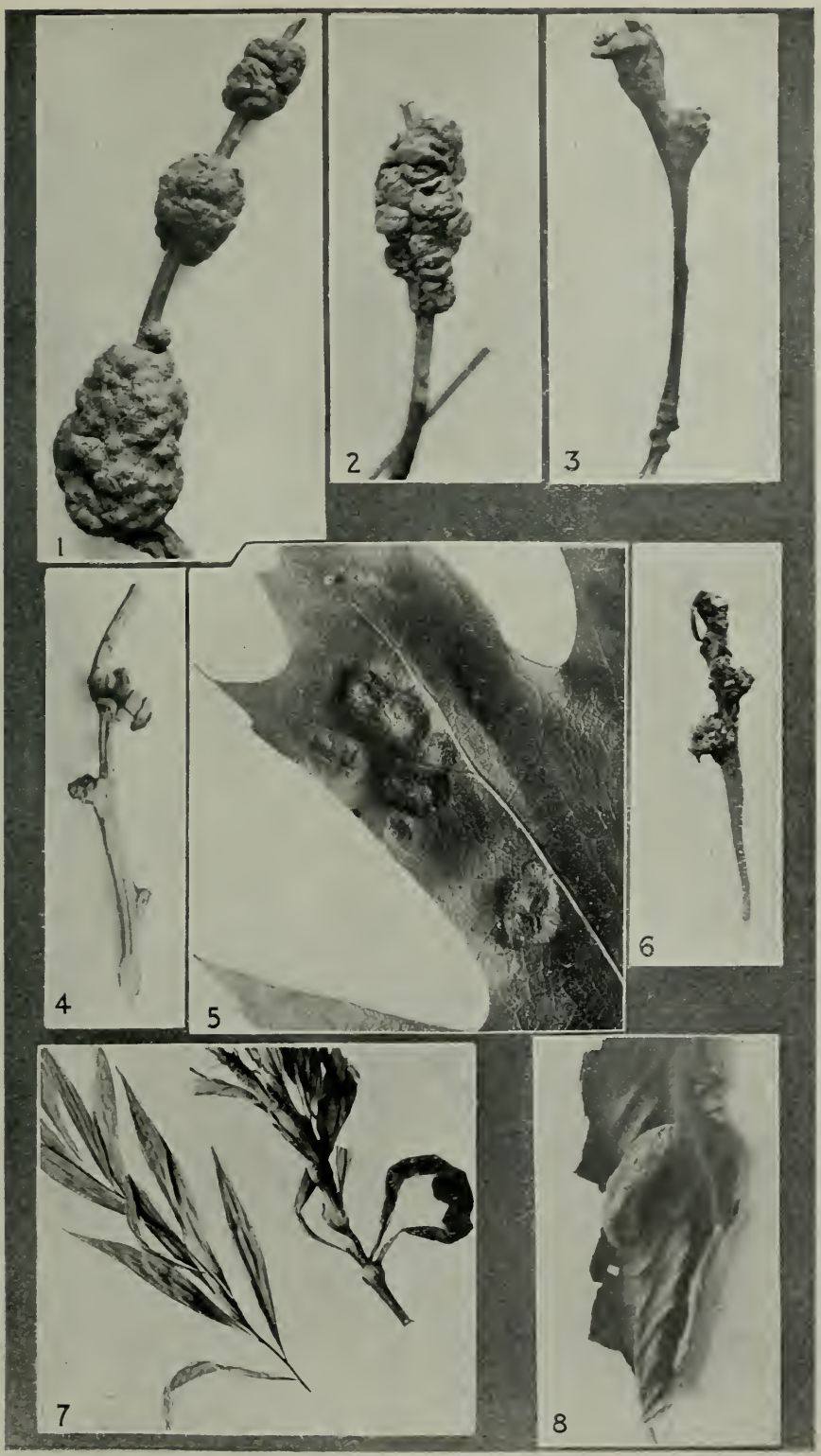

PLATE C.

1. Andricus punctatus, Bass.
2. Biorhiza forticornis, Walsh.
3. Andricus clavula, Bass.
4. Cynips strobilana, O S.
5. Andricus papillatus, O.S.
6. Andricus topiarius, Ashm.
7. Eucosma scudderiana, Clem.
8. Pemphigus ulmi-fuscus.

PLATE D.

1. Eriophyes sp., Amelanchier Canadensis.
2. Eriophyes sp., Juglans nigra.
3. Eriophyes sp., Populus italica.
4. Eriophyes sp., Vitis cordifolia.
5. Eriophyes sp., Salix fragilis.
6. Young Oyster-shell scales parasitized by a fungus.
7. Curtis scale parasitized by a fungus.

Parasites:

(1) A fungus disease (Cordyceps clavulata), attacks and destroys many of the scales.

(2) At least 3 chalcid flies, *Pachyneuron altiscuta* (How.) *Eunotus lividus* (*Ashm.*), and *Coccophagus cognatus* (How.)

(3) Several species of lady-bird beetles.

(4) A large flesh-colored species of larva was found feeding on the eggs but we were not able to rear the adults.

The Terrapin Scale, *Eulecanium nigrofasciatum* (Perg.)

This scale was first discovered in Ontario in 1901 at St. Catharines. Up to the present time it has been reported to us only from St. Catharines, Walkerville, and Windsor. In each case the infested twigs forwarded were taken from maple trees and these were literally covered with the scale. It is clear from such specimens that a badly infested tree would soon die, and so the scale is one to be guarded against. Mr. Sanders of the Bureau of Entomology, Washington, in his circular No. 88, says that the scale must be considered a "dangerous pest."

The easiest time to recognize this scale is in the winter stage. At this season it is considerably smaller than the New York Plum scale, *Eulecanium cerasifex*, which, even when mature, it never equals in size. It has the same general shape as this well known scale, being nearly hemispherical. It is about 2 mm. in length and slightly less in width. Along the top running longitudinally is a reddish streak or stripe about 1 mm. long and .3 mm. wide. The rest of the surface is usually mottled red and black, the red forming the ground, so to speak, and black stripes radiating from the reddish top to the base. Sometimes the black forms a belt around the scale extending from the red boss or crown nearly to the base, which has also often a red margin in such cases. Not uncommonly a scale looks almost entirely red or on the contrary almost entirely black. When mature there is still the same general color and shape but there is an increase in size, the scale now being 3-3.5 mm. long and somewhat less than this broad. Later in the season the color fades.

A peculiarity, at least, of the winter stage of the scale is that when punctured or crushed, a reddish liquid exudes from the wounds.

The eggs are laid in the spring and hatch about the end of June. In August the tiny winged males emerge and consequently the half-grown females are fertilized the same season.

Although only maple trees have been reported to us as being attacked up to the present time in Ontario, yet we find that in the United States the scale infests not only these but also the peach, plum, apple, pear, quince, hawthorn, and several other trees. Hence it is clear that fruit-growers should be on their guard against it.

Remedies:

The lime-sulphur wash has proved a failure in the case of this scale and the most satisfactory remedy so far discovered is to spray the trees carefully when the leaves are off with kerosene emulsion of about 25 per cent. strength. Care should be taken to prevent the emulsion running down the trunk and getting to the roots which it would probably injure. Late autumn or early spring before the buds begin to burst would be the proper time to spray. While this is practically the only spray recommended against this scale insect, some very able entomologists doubt whether even it is anything like so successful as its advocates claim. Seeing that there is so much doubt about the effectiveness of washes and that the scale is capable of doing grea

damage, the proper course to take is to be on one's guard against allowing it to get a footing and, if a tree should be found to be infested, cut it down and burn it at once, thus taking no risks.

Parasites:

This scale like almost all the rest has its insect foes, a tiny chalcid fly of the genus Coccophagus has been found to attack it. A fungus parasite known as Cordyceps clavulata is not uncommon on this scale.

Eulecanium caryæ, (Fitch).

Eulecanium caryæ is said to be the largest known species of Eulecanium. It has been in Ontario for at least ten years, having been discovered by Dr. Fletcher in the Niagara district in 1898. Judging from the fact that it has been found in that district and that we have discovered it at Guelph on several trees in the forest, it probably occurs at least all over the south-western part of Ontario. From our own experience and that of others we believe that the scale is very seldom abundant on any tree; in every case where we discovered mature scales there were only two or three at most, and often only one specimen to be found on a branch (always on the under side). Consequently the scale is seldom sufficiently injurious to cause any alarm.

It is easily identified by its large size, being more than twice as large as the New York Plum scale (Eulecanium cerasifex). Like this scale Eulecanium caryæ is more or less hemispherical in shape. It is 7-10 mm. long, 6-9 mm. broad, and 3-4 mm. high. The surface is glossy, light brown to black in color, and covered with a fine powder. On all the specimens a keel-like structure ran longitudinally from end to end through the centre. The rest of the surface was more or less rugose. In some cases we could see fine (including the keel-like structure), nearly parallel longitudinal ridges; in others these ridges, except the keel, were not perceptible.

We have not yet traced out the life history of the scale, but from observations made believe that it is probably very similar to that of the New York Plum scale; that is, it passes the winter in the nearly mature stage, the males emerge in late spring; the eggs, which are very numerous and white in color, hatch out in July; the young migrate to the leaves and re-migrate to the branches in the autumn.

This scale has been found at Guelph on the hawthorn and American elm, and at St. Catharines on the peach.

Remedies:

Seldom any need be applied, but the same remedies as are used for the New York Plum scale should destroy this one.

Parasites:

There is a very little doubt that the failure of this scale, laying as it does a very large number of eggs, to increase rapidly is to a great extent due to the attacks of parasites. Dr. L. O. Howard informs us that a chalcid, Chiloneurus albicornis, (How.) attacks it. (Bull. vii, N. S. Div. Ent. U. S. Dept. Agr. 1897, p. 63). This is one of probably a considerable number of parasites.

Kermes pubescens (Bogue).

Kermes pubescens is a large scale resembling the New York plum scale and other Eulecanium scales, but differing in external appearances chiefly in being more nearly spherical. It has been found by us at Guelph, Toronto, and Perth, hence is probably wide spread over the province. Only oak trees are attacked, as it was found in abundance on each infested tree it must do considerable injury. Mr. Bogue, who discovered and named the scale, reports it as attacking the young twigs and leaves, but we have always

found it in the cracks of the bark on the trunk and branches and have not yet observed it on very young twigs or on leaves.

The mature female scale is nearly spherical as a rule in shape, though often it seems to be modified in form by its position in the cracks or fissures of the bark. It is 3-4 mm. long, 3 mm. high, varies in color from light to dark brown, often mottled with black, is shiny in appearance and covered with a short white pubescence.

The male scale resembles very much the male of the New York Plum scale. It is, however, whiter, being snow-white. In shape it is oblong, 2 mm. in length, 1 mm. in width and fairly convex.

The winter is passed by both sexes in the nearly mature stage. The males emerge about the first of June or a little earlier. This year '07 the season was late and they were observed coming forth June 12th. Though the females are fertilized shortly after this we have not yet had opportunity to discover the date when the eggs hatch.

Remedies:

(1) Kerosene emulsion 25 per cent. put on when the trees are dormant should kill the scale. The tree must be soaked, however, to ensure the spray getting into the crevices of the bark where the scales are.

Parasites:

A considerable number of the scales observed had been perforated, evidently the work of a small chalcid fly.

The Cottony Maple Scale, *Pulvinaria vitis* (L.).

The Cottony Maple Scale is by no means a stranger in Ontario. It is found all over the western part of the province at least, and probably over much of the remaining parts also. As the name indicates, it attacks the maple chiefly, and in cities often does much damage to maple shade trees. It is, however, rarely abundant for many seasons in succession, because of the attacks of parasites.

The scale is most easily identified in spring or early summer. At this time of the year it appears as a brown, elliptical, convex insect, with so large a cottony-like egg-mass protruding from behind and beneath that the scale seems to be standing on its head, or nearly so. The egg mass and scale together are about 1 cm. long, the scale itself being about 1-3 of this length. The cottony egg-mass has given the scale its name and makes its identification easy.

The young lice hatch about the middle of June usually, the hatching period extending over a couple of weeks. The tiny insects at once migrate to the underside of the leaf, though some also establish themselves on the upper surface. On the leaves they usually arrange themselves alongside the midrib and veins. About the end of August the winged males emerge and fertilize the females. A few weeks later the females desert the leaves and go back to the branches, where they pass the winter. In the spring of the year they rapidly swell, and in early summer form the cottony mass and lay their eggs in it. Hence there is but one generation in a year.

Although the maple trees are the ones most commonly attacked, the scale is found on many other trees as well. It has been found at Guelph on the following maples: Acer saccharum, A. saccharinum, A. nigrum, A. rubrum, and A. negundo; also on basswood, American elm, hawthorn, white poplar (Populus alba), scrub willow, red-osier, dogwood, ilex (verticillata), Spiræa (salicifolia) and grape vines.

Remedies.

Except in towns there is very little need of using any remedy because parasites keep the scale well in check and, as mentioned above, it is seldom bad many years in succession. In towns, await the hatching of the young, and shortly afterwards prune severely, and where valuable trees are attacked spray these thoroughly with kerosene emulsion, flour kerosene or whale-oil soap. More than one spraying will probably be necessary.

The Oyster-shell Scale, *Lepidosaphes ulmi*, (Linn.) Fig. 25.

The Oyster-shell scale is found in almost every district in Ontario, and is doing more injury to the fruit trees of the province as a whole than any other scale.

The scale can easily be recognized even without the aid of a lens. It is 2.5-4 mm. long, and .75-1 mm. wide in the broadest part, tapers toward the the end, is shaped like a diminutive oyster-shell, and closely resembles in color the bark on which it is found. The small end, or exuvia, is usually much lighter in color than the rest. The male scale differs from the female chiefly in being considerably smaller and broader in proportion to its length.

It passes the winter in the egg stage, from 20-100 eggs being concealed under the covering of a single scale. The eggs hatch about the first week in June. The tiny, white, young scale insects run about for a day or two on the bark or leaves and then insert their sucking tubes in some chosen spot from which they never move during the rest of their life. There is only one brood in a season, but even so, the scales increase very rapidly where no attempt is made to keep them in check. Badly infested trees become much weakened and often die.

Not only does this scale attack apple, pear, plum, and cherry trees, but it also attacks currants, gooseberries, rose bushes, spiræas, lilacs, and numerous shade and forest trees, such as the mountain-ash, hawthorn, red-osier dogwood, black and white ash, American aspen, prickly ash, mulberry, and horse-chestnut.

Remedies.

There are several remedies that can be used with success in combating it: —

(1) Spray with kerosene emulsion, flour kerosene, or whale-oil soap during June as soon as all the eggs seem to have hatched. This date can easily be ascertained by examining carefully, even with the naked eye, a few infested branches. These remedies are the most popular.

(2) The lime-sulphur wash. This remedy, though not so popular as No. 1, has given excellent results when well made and carefully put on late in the spring when the buds are well swollen or are opening.

(3) Whitewash. The trees must be sprayed twice, with an interval of a few days between, with whitewash. This should be done as soon as the leaves fall in the autumn. Use 1 to 2 lbs. lime to 1 gal. water.

Parasites.—The most common parasites are: (1) A tiny little mite, probably *Tyroglyphus malus*, that preys both upon the adult and the eggs; (2) a small, yellowish chalcid fly, probably *Aphelinus mytilaspidis*, Le Baron, the larva of which preys upon the eggs (scales perforated by small, round holes have been parasitised by this kind of insect); (3) certain species of ladybird beetles, especially the twice-stabbed lady beetle (*Chilocorus bivulnerus*) Muls. This year we found a pink fungus attacking the young scales, and on a mountain ash tree, in Toronto, which was covered with scales, the pink fungus parasitised and killed nearly all the scales on the tree. (See Plate D. Fig. 6.).

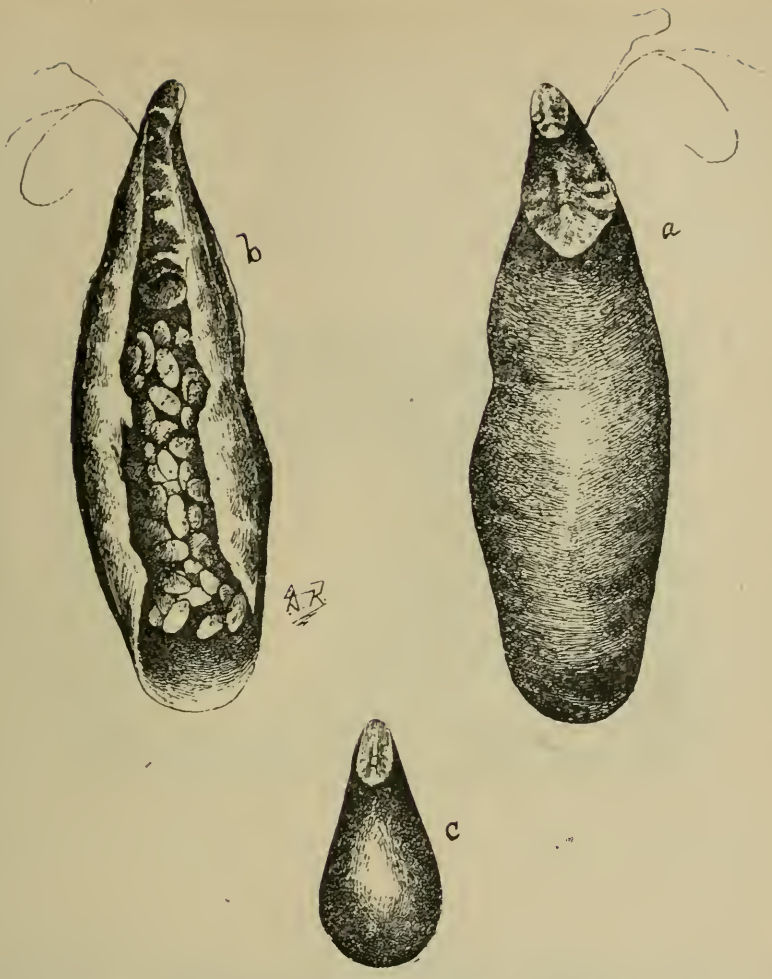

FIG. 25. Oyster-shell Barklouse (*Lepidosaphes ulmi*). (a) Adult female, back view, showing the two moulted skins at anterior end, and the bristles of the sucking tube; (*b*) adult female turned over, showing the insect at the anterior end and the eggs at the posterior end; (*c*) adult male scale, much smaller than female, with one moulted skin at anterior end.

The Scurfy Scale, *Chionaspis furfura*, (Fitch). Figs. 26 and 27.

The Scurfy Scale, though widely distributed throughout Ontario, is seldom found in so great abundance as the Oyster-shell. Badly infested trees or other plants are very much weakened and not infrequently die as a result.

The mature female scale is somewhat of the shape of the Oyster-shell, but is much broader in proportion to its length, and is more properly described as pear-shaped, being 2-3 mm. long, 1-2 mm. wide in the broadest part and tapering rapidly to a fine point at one end. It is very slightly convex and is grayish white in color. The scurfy appearance which it gives to a badly infested branch or twig has evidently been the cause of its receiving its present popular name.

The male scale is very different from the female. It is elongate in shape, is only about 1-3 the length of the female, is whiter in color and has three parallel longitudinal ridges on its back (tricarinate).

The Scurfy Scale has a very similar life history to the Oyster-shell. It passes the winter in the egg stage, there being from 20-80 purplish red eggs under a single scale covering. About the first of June these hatch into tiny orange or reddish brown larvæ, which run about freely for a few hours, and then in some favourable place insert their sucking tube, or proboscis, into the bark, leaf, or fruit and remain stationary henceforth. There is only one generation in a year.

Many kinds of trees and shrubs are attacked by the scale, but the most common are the apple, pear, quince, currant, gooseberry, mountain ash, white ash, hawthorn and horse chestnut.

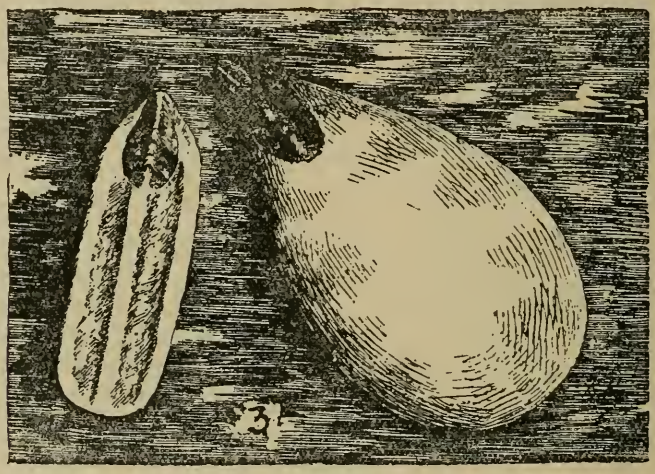

Fig. 26. Scurfy Bark-louse (*Chionaspis furfura*). Adult male and female.

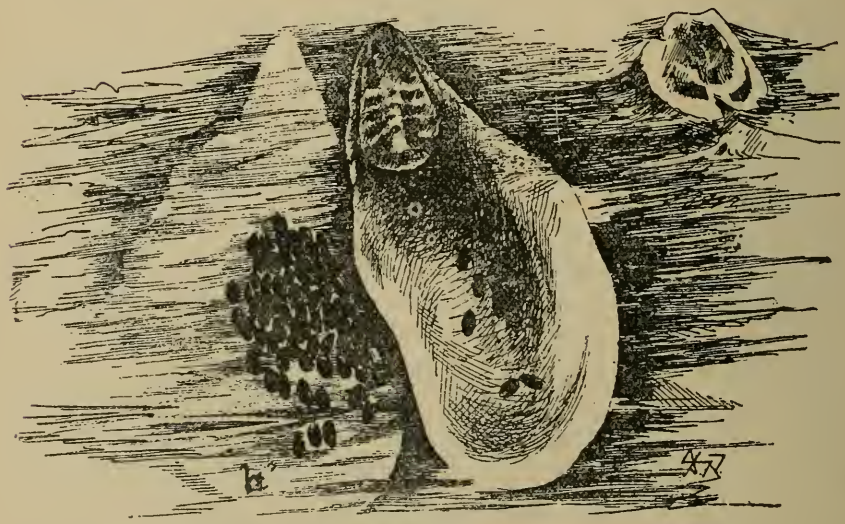

Fig. 27. Scurfy Bark-louse (*Chionaspis furfura*). Adult female, under surface, showing the insect at anterior end, and the numerous purplish eggs.

Remedies.—The same remedies should be used as for the Oyster-shell scale.

Parasites.—The parasites are largely the same as those that attack the Oyster-shell. The most common are (1) the mite, *Tyroglyphus malus* (Schimer); (2) a small chalcid, *Ablerus clisiocampæ*, Ashm; (3) the twice-stabbed lady beetle, *Chilocorus bivulnerus*, Muls.

The Rose Scale, *Aulacaspis rosæ*, (Bouche).

Here and there all over the province we find the Rose Scale attacking rose bushes, and blackberry and raspberry canes. The plants attacked are nearly always in damp, shady places, such as overcrowded gardens, and it is seldom that we find the scale out in open, airy plots.

The mature female scale is nearly circular in shape, moderately convex, 2-2.5 mm. in diameter, almost snow-white, except for a brownish yellow spot, the exuviæ, situated towards one side and extending nearly to the centre.

The male scale is also white, but is very different in shape and size. It is elongate, about 1 mm. in length, 3 mm. in width, and has three parallel ridges running longitudinally along the upper surface.

The scale may pass the winter in almost any stage, from the egg to the mature insect. Breeding goes on almost continuously from the warm days of spring to the severe frosts of late autumn.

Remedies.—From the tendency of this scale to occur almost solely on damp, much shaded plants, the most rational method of treating it is to prune out the bushes so as to let plenty of air and sunlight get access to them. In this pruning, of course care should be taken to cut out the worst infested parts. In special cases, it may be necessary to resort to lime-sulphur, kerosene emulsion, or whale-oil soap, to be applied when the plants are dormant. Invigorating the plant by fertilizers is also helpful.

The Pine-leaf Scale, *Chionaspis pinifoliæ*, (Fitch).

The Pine-leaf scale is very common in many parts of Ontario, and is probably found all over the province. It has not, however, so far as we know, caused any perceptible injury to the trees, although reports from New York state go to show that wherever it is very abundant on a tree it does much damage.

The scale is easily identified from its shape, size, color, and the fact that it is only found on coniferous trees. The female scale resembles to a large degree the Oyster-shell scale in size and shape, but unlike it is seldom curved and is almost entirely snow-white, except for the exuviæ, which are dull colored. The scales are not always of the same shape, some being longer and narrower in proportion to their length than others. This, in many cases, seems to be due to the shape and size of the needles they are situated on. The average length is 2.5-3.5 mm. and the average width .75-1.3 mm. The scale is more convex than the Scurfy Scale and is a little thicker in texture, though not nearly so thick and firm as the Oyster-shell scale.

The male scale very closely resembles the male Scurfy scale, and like it is less than one-third the size of the female scale. It is elongate, about 1 mm. long, 3 mm. wide, snow-white in color and has three parallel ribs or ridges running longitudinally along the upper surface.

The winter is passed in the egg stage. From 20-70 purplish eggs are to be found beneath a single scale cover. The eggs usually begin to hatch about the end of May, but this season were about three weeks later. There are said to be two broods each year, the females of the last brood laying their eggs late in the autumn.

The scale, as mentioned above, confines its attack solely to conifers. We have found it at Guelph on the following pines: White, Bull, Austrian,

Scotch, Jack, and Dwarf Mugho, and also on the Norway and White Spruce.

Remedies.—As a rule, there is no need of resorting to any remedy to control this scale as it is seldom sufficiently abundant to do much damage. If, however, it should be found in such numbers as to injure perceptibly trees in a lawn, kerosene emulsion can be used, but this would be impracticable, of course, in any place where there were a very large number of trees to treat.

Parasites.—About one-third of the scales examined this year were found to have been parasitised, apparently by a Chalcid fly. A species of mite was also found preying upon them. Thus it is probable that we owe much of our security against the rapid increase of this insect to these parasites.

THE LIME-SULPHUR WASH.

By L. Caesar, Ontario Agricultural College, Guelph.

From time to time during the last two years questions have arisen in connection with the lime-sulphur wash which have made the Entomological department feel that there was need of a further study of this important mixture in order that they might be able to give fuller and more definite information to fruit-growers. Accordingly Dr. Bethune and Mr. Jarvis, not having an opportunity themselves to devote their attention to this subject on account of the mass of other work to which they have to give their time and energy, asked me to begin the investigation this year.

After reading the best literature I could find on the subject and getting valuable suggestions in this way, I began to make the mixture on a small scale in the chemical laboratory, where I could use glass vessels and see the different phases passed through, so far as there was any physical evidence of these. It was my intention at first to attempt to study the chemistry of the wash, but I soon found that this would make a whole season's work and that in any case the field experiments were necessary first to show what chemical problems there were. This autumn Professor Harcourt of the Chemical department informed me that his department intended, if possible, this winter to study the chemical side of the wash. He asked me to let him have a list of any chemical problems that had occurred to me in connection with my work on it during the season.

After some laboratory experiments I began my field experiments. Any experiments, however, made at Guelph alone would be inadequate, because we have no San José scale here, and because we are also free from a number of plant diseases that are very troublesome in the more truly fruit-growing districts of the province. Hence, I determined to make a trip to the Niagara district in the spring when the wash was being applied to the trees, and again in the fall to see the results, and to interview the best fruit-growers to find out their experience with the wash. I tried, moreover, wherever possible, to supplement my own experiments by visiting particular orchards in other districts or communicating with men who were using the spray. In these ways considerable information about the wash has been obtained, although I am aware that it will require further experiments for two or three years longer before we shall know all that we should about this mixture.

I shall not attempt to give any account of the details of the experiments made, but rather will discuss the different points of interest in succession. Before proceeding to deal with these points, I should say that it was not

merely a few trees that were sprayed with the mixture at Guelph; almost 600 gallons of the spray were put on. Each tree was carefully done but was only sprayed once.

What Formula Shall We Use?

One of the first points of interest is to determine what formula is most satisfactory. While this is an important matter, yet there is room for a considerable amount of freedom. In countries like California and some other American States where there is very little rain, a weaker mixture than will suit our conditions may be used with good results. I found that the chief objection to using a formula as weak as 15 lbs. lime, 12 lbs. sulphur and 40 gallons water was that the spray was washed off the twigs too quickly by the spring rains. It is very important, however, that the spray should remain on all parts of the tree as long as possible. The lowest formula that seemed to me satisfactory, from my own experiments and those I observed elsewhere, was 20 lbs. lime, 15 lbs. sulphur and 40 gals. water. This formula has given excellent results. For instance, Mr. W. H. Bunting, of St. Catharines, one of the most successful fruit-growers, has used it for some years, and though the San José scale has been in his orchards for a long time and is very bad in neighboring orchards, he keeps it under complete control with lime-sulphur of the above strength. Many farmers, however, prefer to use a slightly stronger wash. The majority of those I met in the St. Catharines district used 22 lbs. lime, 18 lbs. sulphur and 40 gals. water. This is also about the average strength used at Grimsby, Winona and Fruitland. There is no trouble whatever in spraying a mixture as strong as this or even stronger, as I myself proved. New nozzles of the type of the "Friend" allow such mixtures to be put on in a fine mist without any trouble from clogging. There can be no objection then to a fruit-grower using a mixture of this strength or even stronger except that where spraying is done every year 20 lbs. lime, 15 lbs. sulphur and 40 gals. water give practically as good results and the expense is considerably less.

First Steps in Boiling.

Having decided then that 20 lbs. lime, 15 lbs. sulphur and 40 gals. water shall be the minimum strength, let us next consider the best way to go about making the wash. After testing several ways, I found none more satisfactory than the following: put about 13 gals. (about one-third of the total 40 gals.) of boiling water into the barrel. Turn off the steam and at once put the 20 lbs. of lime into the water. (Care must be taken to use only fresh unslaked lime). When the lime has begun to slake vigorously add the sulphur, which should have been made into a thick paste with boiling water before the lime was added. The whole should now be stirred as well as the boiling will permit. When the boiling begins to slacken, turn the steam on again. Stirring should be repeated every five minutes or so in order that any little lumps of sulphur may be more readily broken up and go into combination. Boiling must always be vigorous, so vigorous as to keep the contents of the barrel in constant commotion and cause the liquid to splash up to the top.

How Long to Boil.

One set of experimenters used to say that boiling should be continued until the deep green color came, others said to boil until the orange or amber shade was reached. When Prof. Harcourt and I visited the St. Catha-

rines district last spring and saw the dirty, dark green color characteristic of most of the spray that was being used, we both remarked that we could not possibly get such a color with our Guelph lime. On our return I procured, with Prof. Harcourt's assistance, a bushel of lime from Port Colborne and another from Beachville. Laboratory tests were made with each of these, and with Guelph and Caledon limes, to see what color of wash would be obtained from each kind. The results were interesting. Port Colborne lime gave a dirty dark green, Beachville a greenish orange or greenish yellow, Guelph was slightly lighter in shade, Caledon gave a green but one considerably lighter than that from Port Colborne lime. Each kind of lime was boiled for one hour under as nearly as possible exactly similar conditions. The formula used was 22 lbs. lime, 18 lbs. sulphur and 40 gals. water. Hence it is quite clear that the color obtained depends solely upon the kind of lime used. For general directions, therefore, it is not possible to say what color must be reached. The best way is to boil *vigorously* for one hour. By the end of this time all the sulphur will have entered into combination with the lime and further boiling will not make the wash more effective. It should be remembered that if the barrel is nearly full or even half full of water, it will not boil quite so rapidly as if there were only about 13 or 14 gals. of water in it.

Is it Necessary to Use any Special Kind of Lime?

Whether the lime of one's own district will give satisfactory results or not is an important question. There is very little doubt that the lime with a high percentage of calcium in it is more desirable than a lime like that of Guelph, containing nearly 40 per cent. of magnesium.

This element will not unite chemically, to any extent at least, with sulphur, and hence to some degree weakens the wash. However, I have found that even Guelph lime will give good results though not quite so good as Port Colborne or Beachville lime. Of these latter two, Port Colborne was the more convenient to use, because the wash made from it stands up better than any other I have experimented with, and so requires less agitation in the field. If any one is in doubt about the spraying value of his lime, he could easily have it tested by forwarding a sample to the Chemical department, but there is little question that good results will be obtained from almost any kind of lime. It is always easy to send for a bushel of some known lime like Port Colborne and compare results with those from the home lime.

The Dilution of the Mixture.

Many farmers dilute with cold water, but it is more desirable that hot or warm water be used so that the spray will be put on fairly hot. There are several reasons for this: (1) It is easier to spray with a warm than a cold mixture because the nozzle is less likely to clog. (2) The spray penetrates crevices and covers the bark better if put on hot. (3) If the mixture is allowed to cool there is a danger of certain substances crystallizing out in the form of tiny orange needles. This fact suggests that, if for any reason the mixture is left over night, it will be necessary to reboil it for a short time to bring these crystals into solution again. A convenient method that I have used is to dilute with cold water and then turn on the steam for a few minutes to heat the barrel up a few degrees before transferring the mixture to the spray tank.

Devices for Boiling.

Much the handiest and cheapest method of boiling is that a number of farmers should club together and hire a man to boil for them with a steam-engine. An ordinary threshing engine is generally used. An engine of this sort can be so adjusted as to boil from eight to ten barrels at once. A number of farmers have small upright steam generators, each of which costs about $125. This is a very satisfactory method of boiling. Many farmers, however, are doing excellent work with ordinary large iron kettles, each holding about 20 to 25 gallons. These are either placed in a brick arch or are enclosed by sheet iron so as to concentrate the heat and prevent the wind from blowing the flames in every direction. One enterprising young Englishman had no engine or kettle, so he made a tight-fitting box of planks about 6 x 4 x 1½ ft. in size and covered the bottom and sides of this with sheet-iron to prevent the wood from catching fire. A small foundation about a foot high was built for the box to rest upon. An opening was left in the front of this to throw fuel in and a stove pipe arranged at the other end to draw off the smoke and create a draft. Upon the box a cover was placed of boards nailed together but with an opening along the centre to work a hoe in to stir the liquid. This simple device worked splendidly and good mixtures were made by it.

It is perhaps unnecessary to say that very few of the fruit-growers are to-day using the self-boiled method of preparing the wash. It has not given nearly so good satisfaction as the other method.

Things to Observe in Spraying.

One often hears a great deal about the unpleasantness that accompanies the use of lime-sulphur. Much of this objection can be removed by attending to the following points: (1) Every precaution should be taken to choose as convenient a place as possible for making and loading the spray. This place should not be allowed to become muddy. The use of a few boards and the digging of a little drain if necessary can usually remedy this defect. (2) Spraying should be done only with and never against the wind. (3) Long hose should be used so that the driver and horse need not be brought close to the tree, and so may escape getting covered with the spray. (4) Workmen should be provided with suitable gloves to protect their hands. (5) A nozzle that will not easily clog, such as the "Friend" or "Simplex" should be used. Of course the spray should be carefully strained before it enters the tank.

To give satisfactory results good, careful spraying must be done. A day or two after an orchard has been sprayed, the spray-wagon should be taken over it again and any twigs or branches that have been missed can then be clearly seen and sprayed. Unless every part of the tree is drenched, the best results cannot be obtained. Some fruit-growers take so much care to see that every tree is thoroughly done that they even go through the orchard a third time to touch up any poorly sprayed places.

The Best Time to Spray.

I have not yet had a chance to test the merits of fall spraying. It is well known that it does not meet with so much favor as spring spraying. There is no doubt, however, that if a man knows that for some special reason he is likely to be unable to spray in the spring, he should by all means do so in the autumn as soon as the leaves fall. Of the spraying that is done

in the spring my experience leads me to give a decided preference to that which has been put on when the buds were actually bursting, compared with what was sprayed a month earlier. I find that the longer the wash remains on the trees the better the results. Now a spray put on a month before the leaves come out will wash off much more rapidly than that put on when the buds are opening, for the simple reason that, in the latter case, the leaves coming out soon after, break the violence of the rain and to a very considerable extent protect the spray. Many other experimenters have found the same result. In Bulletin No. 107 of the year 1906, Prof. Forbes, of Illinois, says, that January applications were only about half as efficient as those made in March. Allowing for difference of climate this would be practically the same thing here as spraying in March compared with the end of April. I found that trees sprayed for Oyster-shell scale on March 9th seemed to be but little benefited, whereas a very large per cent. of the scale was killed on those sprayed on May 10th, that is two months later. In every case where I examined trees for either Oyster-shell or San José scale I found that those on which the wash had remained longest showed much the best results; and, other things being equal, these were always the last sprayed trees.

But some one may ask, "How late is it safe to spray?" Personally I think it is perfectly safe to spray until the buds are nearly open. I sprayed a few currant bushes when the leaves were nearly an inch wide, and there were scarcely any signs of injury to the foliage. Apple and plum branches were also sprayed when the buds were almost open; a very slight sign of their having been burned in some cases around the edge was all the injury I could detect. I have seen a number of plum trees sprayed when the buds had practically burst and yet no injury resulted. In the Niagara district I made a number of inquiries on this point and in every case got the answer that it was quite safe to spray even while the buds were actually bursting. Peach trees, having a very tender foliage, should not be sprayed quite so late as more hardy trees. I found that a number of the farmers next year think of spraying, as an experiment, a few trees just after the blossoms have fallen. Their object is to see the effect upon aphids, plum rot, and apple and pear scab. Mr. J. W. Smith told me of an interesting experiment that had been performed by his tenant, Mr. R. Doughbrough, on Mr. Smith's farm at Vineland. I called on Mr. Doughbrough and asked him for further information. He said he had sprayed some pear and plum trees this spring just after the blossoms had fallen. He used the full strength 22 lbs. lime, 16 lbs. sulphur and 40 gals. water, boiled for 45 to 60 minutes.

The foliage, he claimed, was practically uninjured and was equally as good as that on trees sprayed earlier in the spring. The results upon the scab will be referred to later. Though Mr. Doughbrough was able to spray so late this year without injury, it is very probable that a difference of weather would have caused the spray to burn the foliage severely. Therefore, while it is advisable to spray as late as is safe, all spraying should cease before the blossoms come out. In any case the blossoms and leaves would prevent the spray from covering the bark of the tree thoroughly and so scale or other hibernating insects could not be so effectively controlled.

The Effect of Rain.

The question has sometimes been asked whether, if rain comes after spraying, it will be necessary to spray again. The best answer to this ques-

tion is that those who have any doubts about the rain having injured the spray should examine the trees a day or two later and see whether it has been washed off. If it has, the bare twigs or branches should be given another coat of the mixture. I sprayed a few trees purposely during a moderately heavy shower to see the effect. A day or two afterwards I examined them and found, as I expected, that there was very little of the spray on them. Some other trees, however, had been sprayed an hour before the shower began and had had time to become dry; these were not visibly affected by the rain and sleet. It stands to reason, moreover, that one should not spray immediately after a shower but should wait until the trees are dry. Before leaving this subject it is perhaps well to remove the misconception that at least some mixtures of lime-sulphur, once they have become thoroughly dry, are scarcely at all affected by rain. On one occasion this spring I investigated this point during a fairly heavy rain. Some of the trees had been sprayed with Port Colborne lime, others with Beachville, others with Guelph. In some cases the wash had been boiled 45 minutes, in others 60, in others 90, and in others as long as 3 hours. In every one of these cases lime was quite visible in the large drops on the underside of the twigs and branches. So that the length of time the wash remains on (one season compared with another) depends to a large extent upon the amount of rain that has fallen. In a very wet spring it is quite probable, therefore, that the efficiency of the lime-sulphur, while not entirely destroyed, would be greatly lessened.

How the Spray Kills.

It is very difficult to say just how the spray kills. Chemists have found that as a result of the chemical reactions that are constantly taking place on the tree, minute particles of sulphur are being constantly set free. Sulphur is known to be not only a good fungicide, but also an insecticide and it is possible that many of the insects like the San José scale, which have a thick covering to protect them, are killed by inhaling the sulphur which would naturally permeate everywhere, even beneath the scale. At any rate sprayed branches examined by me this year showed that by June 8th the San José scale insects were nearly all dead beneath their covering. In many cases the direct caustic nature of the wash seems to be the cause of death, e.g., of freshly hatched aphids. In others, such as the Oyster-shell scale, the wash seems to harden around the scale and prevent the young from hatching or from emerging after hatching. Under the same scale coverings of this insect I have found some of the eggs unhatched and others hatched but the young larvæ lying dead as if unable to escape. Of course it is very probable that some sort of caustic action also helps in destroying this scale. I have noticed that the scales are nearly always more brittle and so more easily removed on the sprayed trees than on the unsprayed; so that the eggs may to some extent be exposed to the weather and thereby destroyed. The same thing may hold true of the San José scale insects. I have not found, however, that a very large percentage of deaths is due to the scales being loosened and falling from the trees. Not more than three per cent., I think, of the Oyster-shell scale were destroyed in this manner. Later on in the season, however, the old dead scales on the sprayed trees began to peel off and leave the bark fresh and clean. Probably one of the most effective ways in which the wash acts as an insecticide is in keeping the bark covered and either making it difficult for the young scale insects to find a suitable and attractive place to settle down and insert their sucking tubes, or else making it impossible for them to insert them at all.

The fungicidal value of the wash is probably due, first to the sulphur and certain sulphur compounds which are well known to have a fungicidal value, and secondly to the covering left on the tree acting as a means of preventing spores from finding so favorable a lodging place as they otherwise would. The spray that falls on the dead leaves on the ground beneath the tree must do much to destroy spores that are hibernating there. We cannot, however, say definitely just how the wash gets its full insecticidal and fungicidal value.

Kinds of Trees and Shrubs that May be Sprayed.

Many fruit-growers are using this wash now on every kind of fruit-tree and shrub, even on raspberry bushes. A few are using it on grape-vines but this is unusual. It has no known injurious effect upon any of these plants.

Results Upon Insects and Fungus Diseases.

In discussing the results of the spray, I shall take up its effect upon insects first and then upon fungus diseases and upon the general health of the tree.

The San José Scale.

It seems hardly necessary to discuss the effectiveness of the lime-sulphur wash against the San José scale. There is none of this scale at Guelph, hence I had to rely upon my own observations elsewhere and upon the testimony of reliable fruit-growers for my information, on this point. I shall mention a few cases simply by way of illustrating that the wash will most effectively control this terrible pest. In the St. Catharines district the fruit-growers who have carefully and systematically sprayed their trees with this wash are not at all afraid of the San José scale, whereas those who never spray or carelessly spray are rapidly losing their trees by its ravages. Such men as the latter class explain the success of their neighbors on the ground that Heaven is kind to some people while others never have any luck. But let us take the case of Mr. Bunting, president of the Fruit-growers' Association of the St. Catharines district. On one part of his farm there were four or five rows of pear trees that had been sprayed with Scalecide at the strength of one part to fifteen of water. Nearby in the same orchard were several acres of peach trees that had been sprayed with lime-sulphur. As I walked along between the rows of pear trees and looked at the fruit on the ground, I saw that nearly every pear showed numerous red spots, which said more plainly than words that they were badly attacked by the San José scale. In the peach orchard, however, I sought in vain for some time to find a single scale. Mr. Bunting said there were some left but so very few that one often had to look a long time to find any. Another example of the effect of the wash was seen at Mr. Doughbrough's farm at Vineland. On this farm the lime-sulphur had scarcely been used at all until this year. The rapid increase of the scale, however, caused Mr. Doughbrough to try the wash this season on all infested trees. Last autumn several trees were so badly weakened by the scale that it was thought they would die. It was decided not to cut these down this spring but to keep them as a special test of the merits of the wash. Accordingly each tree was very carefully sprayed. The results surpassed the hopes of Mr. Doughbrough. On all the trees but one there was hardly a scale left and this one had fewer than the previous year. Furthermore the foliage was vigorous and the trees bore almost an average crop of fruit. It is unnecessary, however, to mention other ex-

amples that could easily be given from any farmer who has carefully used this wash against the scale. The fact is that wherever a man says he has not got good results against the San José scale from the use of lime-sulphur, it will turn out on close investigation to have been due to some fault in preparation or manner of application. The wash is at present the cheapest and most effective remedy for the San José scale in Ontario.

The Oyster-Shell Scale.

If we take Ontario as a whole we shall probably find that more injury is being done at present to fruit-growing by the Oyster-shell scale than by the San José, simply because the former is abundant in almost every orchard while the latter is limited to only a few districts. Consequently a good remedy against the Oyster-shell scale would be a great boon to the province. Whether one year's experiments are enough to decide this question is a matter of some doubt. I have endeavoured to make my experiments sufficiently extended to draw accurate conclusions. I have also visited several apple orchards in different parts of the province to compare results. It has been more difficult, however, to determine the effect of the wash definitely than one would have thought. The reason for this is, that owing to the cold, backward spring and the unfavorable weather which followed soon after the hatching of the eggs a very large proportion of the young scales, even on unsprayed trees, died before reaching maturity. When there were so many dead scales it naturally required much more careful work to determine accurately the effects of the wash. I found that on the trees that were sprayed before the middle of April almost all the eggs hatched out; on those sprayed about the middle of April much fewer, and on those sprayed in May when the buds were bursting, only a small percentage hatched. In other words wherever the wash remained well on the tree and covered it, there were very few eggs hatched compared with the cases where it washed off before the hatching season. Not all the eggs, however, on any tree were killed. I found practically the same results in other orchards. But some farmers, whose orchards I had not a chance to visit, reported that the wash had been useless. I think the majority of fruit-growers who have tried lime-sulphur only once or twice for the Oyster-shell scale have not been satisfied with the results. I believe the reason for this is largely that they sprayed too early in the spring and did not cover the trees so thoroughly as they should; in short they did not drench the trees from top to bottom. Had these points been attended to they would have killed a large percentage of the scale, though not all in one season. I have observed that where orchards are sprayed every spring for a number of years in succession there are practically no Oyster-shell scales left. But it is not enough to examine the trees soon after the eggs have hatched; they should also be examined later in the season to see what proportion of the young larvæ has matured. I find that on the trees that showed the most successful results in July, it is difficult to discover a single living scale this autumn. Yet one should not draw inferences rashly from this condition of affairs; for as I have mentioned above a very large percentage, apparently as high as 75 per cent. of the young scales died even on the unsprayed trees here this year. If then we are to judge by the earlier results we can only say that lime-sulphur is not a perfect remedy for Oyster-shell scale if it is only to be applied once; but that if it is put on late in spring and repeated for several years in succession it gives excellent results. For a single application I believe kerosene emulsion or flour-kerosene put on when the eggs have just

hatched gives better results. Whitewash applied twice in the autumn after the leaves have fallen is said to be an excellent and cheap remedy.

The New York Plum Scale.

All the scales of this species which were covered with the spray were killed and shrivelled up. As these insects hibernate chiefly on the underside of branches and twigs and are sometimes found in great abundance on this part of the lowest branches, great care should be taken to see that the spray is forced up through the tree from beneath as well as driven in from the side or allowed to fall upon the branches from above.

The Pear-tree Psylla.

I asked the opinion of those farmers who have tested the effect of this wash upon the Pear-tree Psylla. The most definite information I got on the subject was from Mr. E. M. Smith, of Winona. Mr. Smith was one of the first men in the district to begin using lime-sulphur. It occurred to him one year that the wash might destroy the Psylla, so he made a special test. A certain plot of pear trees were sprayed with lime-sulphur, and another plot equally bad with the Psylla was left unsprayed. The result was such as to convince him most strongly that the wash would destroy this insect.

Aphids.

Whether the lime-sulphur will destroy aphids' eggs and thus control the aphid pest is a much disputed question. Some of the fruit-growers think it will, others think not, but none whom I met could give definite information. In some of my own experiments this year the aphids had already hatched and were on the ends of the opening buds; some also had worked their way in among the tiny bud leaflets. About 50 per cent., as nearly as I could tell, were destroyed by the wash. Only those died that the spray had actually fallen upon. Those that were in among the leaflets of the bud were of course safe, and in spite of the most careful spraying some of the others failed to be hit. On trees that had been sprayed before the hatching of the eggs, I found it impossible to determine the effect on the eggs simply because there were scarcely any eggs to be found. In order to test this point better, a tree with numerous eggs on the twigs was sprayed this autumn on November 23rd, but it is not possible to determine the results in time for this paper. A number of good entomologists tell us that the wash does destroy the aphid eggs. Every one should test this for himself, and if it prove to be true in our climate as well as in the United States, it will be another strong argument in favor of using lime-sulphur.

The Bud Moth.

The part of the orchard which I sprayed in May was the part where the Bud Moths were worst. So far as I could see from comparing sprayed and unsprayed trees very few of these insects were killed. It is probable that all the larvæ were already out of their winter cases and were in the bursting buds and so escaped the spray. There is need of further experiments to determine the effect upon this pest.

The Codling Worm.

As a result of spraying with Paris green there are very few Codling worms in the College orchard; hence I could not determine the effect of the

wash upon them. It is difficult to see how these insects could be injured by the spray, yet some American Experimenters state that the wash does a good deal to control the Codling worm. The only case that I know of which would tend to show that the wash may greatly lessen the number of codling worms was at Fruitland in one of Mr. Tweddle's orchards. For some cause Mr. Tweddle sprayed about an acre of apple trees at one end of the orchard and situated just at the base of the mountain; the rest of the orchard was not sprayed with lime-sulphur, although both parts were sprayed with poisoned Bordeaux mixture later in the season. When I went through the orchard in September there were scarcely more than half as many wormy apples in the sprayed as in the unsprayed part. Mr. Tweddle attributes this result to the lime-sulphur. Possibly this was the case, but it would be necessary to make sure first that the later spraying with poisoned Bordeaux mixture had not been put on at exactly the proper time in this part and a little too late in the rest. Mr. Tweddle intends to make further experiments on this point next year. It is certain, however, that whatever benefit in this respect may be obtained, the wash will not completely control the codling worm; for in several orchards where it was used there was a very large proportion, about 50 per cent., of wormy apples.

Peach Leaf-Curl.

The evidence in proof of the lime-sulphur as a reliable preventive of Peach Leaf-curl is practically overwhelming. If any one has any doubt on the matter I refer him to such well known fruit-growers as Messrs. J. W. Smith, of Winona, Robert Thompson and W. H. Bunting, of St. Catharines. These and many other successful fruit-growers can, from their own experience, convince any man who is willing to be convinced.

Gooseberry Mildew.

It is well known that the chief difficulty in growing English gooseberries in America is that they are very subject to attacks of mildew, which practically destroys the leaves and fruit. Three years ago, almost by accident, Mr. Joseph Tweddle, of Fruitland, sprayed his English gooseberry bushes with lime-sulphur and was pleasantly surprised to find them comparatively free from mildew that season. Next year, and again this year, he has used the same wash with the same good results. This year Mr. E. D. Smith, of Winona, tried lime-sulphur on his bushes and agrees with Mr. Tweddle in saying that so far as their experience has gone the lime-sulphur makes the growing of this class of gooseberries both possible and profitable. Other fruit-growers in the Niagara district who have heard of these results told me they intended trying the experiment next year. Should these experiments turn out in the way it is expected no small benefit will accrue to the fruit-growers of the province.

Plum Rot.

Very few plums rotted this year, hence the effect of the lime-sulphur upon plum rot cannot to any appreciable extent be determined by this year's experiments. The general consensus of opinion, however, among those who have used the wash on their plum trees for several years, is that it has considerably lessened but not entirely prevented the disease.

Pear Scab.

An interesting experiment to determine the effect of lime-sulphur upon the Pear Scab, when applied much later than usual in the spring, was made by Mr. Doughbrough, of Vineland. Mr. Doughbrough, as I have mentioned above, sprayed some pear trees with lime-sulphur after the blossoms had fallen. These trees had been badly affected with Pear Scab the previous year. Some nearby trees were left unsprayed. The result was that the fruit on the sprayed trees was very much cleaner than on the unsprayed. He said that one could tell by a glance at the gathered fruit which belonged to the sprayed trees, and which to the unsprayed. I have not had an opportunity of finding the effect upon the disease of spraying at the usual date.

I have not been able in this one season to deal with all the problems that have suggested themselves to me in my study of this very useful spray. There are many fungus diseases yet upon which I have either no information or none that is valuable; for instance, apple scab, shot-hole fungus, and powdery mildew of cherry. Moreover the effect upon many insects and insect eggs has not been dealt with. No one orchard, probably no one district, affords an opportunity to make experiments upon all of the fungus diseases and insect pests which are to be found in this province. To get as full information as is desirable experiments must be carried on for several years and by several persons in different localities. The first year's work, though quite valuable in direct results, is perhaps even more valuable in showing what problems should be investigated and how to go about their investigation.

In conclusion there are a few points that should be mentioned: (1) It is clear that the trees treated with lime and sulphur ought to show a more thrifty appearance as a result. This was very conspicuous in many orchards and my attention was frequently directed to it by the fruit-growers. (2) No person should think that because lime-sulphur is such an excellent wash he need use no other spray. It must not be forgotten that lime-sulphur is only meant for a spring or fall wash and there are many fungus diseases and insects that can only be controlled by the use of a summer wash in addition. Poisoned Bordeaux mixture is, therefore, necessary to supplement lime-sulphur. In the careful use of these two spray mixtures lies the secret of much of the success of our best fruit-growers.

AN UNUSUAL OUTBREAK OF HALISIDOTA CATERPILLARS.

By Arthur Gibson, Assistant Entomologist, Experimental Farm, Ottawa.

One of the interesting outbreaks of the season of 1907, has been the unusual number of the caterpillars of two Halisidota Tussock Moths, viz., the Hickory Halisidota, *Halisidota caryæ*, Harr., and the Spotted Halisidota, *Halisidota maculata*, Harr. We have no record of these insects being so abundant and destructive in Canada, as they were during the past season. In the United States, the Hickory Halisidota Tussock Moth has, on several occasions, being recorded as doing much damage in limited localities. During the present year the Hickory Halisidota while numerous and injurious in Ontario and Quebec, was particularly destructive in the Maritime Provinces. The Spotted Halisidota, on the other hand, while also troublesome to some extent in Ontario and Quebec, was specially reported as doing harm in Mani-

toba and Saskatchewan. In the Ottawa district, both of these caterpillars were decidedly more in evidence than is usual and their work could readily be seen, chiefly on elm and basswood trees.

Many specimens and reports of injury by these insects have been sent in. The following extracts from some of the letters received at the Division of Entomology, will give an idea of the extent of the infestations.

The Hickory Halisidota Tussock Moth.

Weymouth, N.S., August 15. "The caterpillars which I sent you on the 7th inst., and which you identified as those of the Hickory Tussock Moth, are very numerous on alder trees. To-day I noticed several trees which were covered from top to bottom with these caterpillars. I also found them on an apple tree, hundreds on a leaf." M. G. DeWolfe.

North Range, N.S., August 16. "I send you some caterpillars which are attacking the beech trees here. They move about from one limb to another. I am also told that they are on the apple trees near by, as well as on the beeches." F. V. McNeill.

Smith's Cove, N.S., August 15. "I am sending you some caterpillars. Please tell me what they are as they are eating the trees very badly. They are mostly on hardwood trees, birch and beech, but apple trees are also being injured." G. W. Potter.

Bear River, N.S., August 21. "Am sending you a small box containing samples of caterpillars that are numerous in some sections of Digby County. Please tell me what they are and give me a remedy for them." B. C. Clarke.

The Spotted Halisidota Tussock Moth.

Lancaster, Ont., August 28. "I found a large number of caterpillars, such as the one I am sending, on apple trees." A. G. McBean.

Brome Centre, Que., August 31. "I am sending a species of caterpillar which has been very numerous and very destructive here." H. H. Millar.

Brandon, Man., Sept. 13. "I am sending you some specimens of a caterpillar which I found quite common in many tree plantations during the past two weeks or more. This caterpillar is found most frequently on the Manitoba maples. I have also found it on Russian poplars, and some of the bush fruits, such as gooseberries and currants, are infested to quite an extent." F. W. H. Jacombe, Inspector of Tree Plantations, Dominion Forestry Branch.

Yellow Grass, Sask., Sept. 13. "The caterpillars which I send have been doing considerable harm by eating the leaves of ash-leaved maples." J. J. Odell.

Barronsfield, N.S., Sept. 16. "I send a caterpillar which seems very destructive. One Manitoba maple tree noticed particularly was completely covered with them." J. H. Seaman.

Mount Hebron, N.B. "I enclose a caterpillar which is abundant on apple trees in this vicinity." H. H. Biggar.

At Rostrevor, on Lake Rosseau, Muskoka, Ont., where I spent the first three weeks in September, the larvæ of the Hickory Halisidota were very abundant. In the rich woods of maple, birch, etc., near by, the caterpillars, which were wandering around in search of winter quarters, could be seen at almost every step. The Spotted Halisidota was also present at Rostrevor, but was not nearly so abundant. Such larvæ of the latter as were seen were all on alder.

From the above quotations, it will be seen that the abundance of these insects in 1907 was much commented upon and caused considerable anxiety. Fortunately, however, these caterpillars appear late in the season and, for

this reason, their injuries were not of such a serious nature as they would have been had the habits of the larvæ been different and the outbreak occurred in June or early in July, when the trees were making most growth.

The caterpillar of the Hickory Halisidota and that of the Spotted Halisidota are very different in appearance. The body of the former is clothed with dense tufts of white hairs, with a ridge of black hairs down the centre of the back, and two pairs of long black pencils on the 1st and 7th abdominal segments, while that of the latter is covered with tufts of bright yellow and black hairs, the black tufts being on the four anterior and three posterior segments and the yellow tufts on the remaining segments. The latter are centered down the middle of the back with a row of black spots. The larva of the Hickory Halisidota is slightly the larger of the two, measuring when full grown about an inch and a half in length.

Both caterpillars are general feeders, being known to attack a great many different kinds of plants. At Ottawa, we have found the larvæ of both species chiefly on elm, basswood, alder, willow, oak and ash. In his "Insects Affecting Park and Woodland Trees," Dr. E. P. Felt says that in New York State the caterpillars of the Hickory Halisidota show a decided preference for walnut, butternut and sumac. The larva of the Spotted Halisidota Tussock Moth is chiefly recorded as an oak-feeding species, in fact it is referred to by some writers as the Oak Tussock Caterpillar. When disturbed, both of these larvæ have the habit of falling to the ground and curling up, in which position they may remain for some little time.

When these two kinds of caterpillars become full grown in autumn, they wander about in search of suitable places to make their winter homes, and when such are found each larva spins an oblong oval cocoon composed of the hairs from its body. The cocoons of both species are of the same size, averaging a little over $\frac{3}{4}$ of an inch in length by about $\frac{1}{2}$ an inch in width. They are different in colour, however, and owing to this can be easily separated. *Halisidota caryæ* has a cocoon of a uniform ashy gray colour, while the cocoon of *Halisidota maculata* is of a decided yellow, from the bright yellow hairs from the larva showing up among the black hairs, also from the

Fig. 28. The Hickory Halisidota Tussock Moth.

Fig. 29. The Spotted Halisidota Tussock Moth.

body of the caterpillar. In some specimens of the latter the yellow is more intense than in others, this of course being caused by more than the usual number of the yellow hairs on the larva. At the present time these cocoons can be readily found in open woods, etc., under pieces of old plank, dry logs, or even stones. On October 8th of the present year, I collected 13 cocoons of the Hickory Halisidota, fastened to the underside of a small piece of board. This was near a large basswood tree on which the larvæ had been feeding. Many other cocoons occurred near by.

Soon after completing its cocoon the caterpillar changes to a reddish-brown pupa, the moths emerging the following June. The Hickory Halisidota Tussock Moth (Fig. 28), measures when the wings are expanded from

1½ to nearly 2 inches. The ground colour of the forewings is ochre-yellow, but is heavily dusted with brown scales. On the forewings are five, more or less, transverse bands, or rows of spots joined together. The outer two rows of these are pearly, the others mostly the ground colour of the wings, edged with brown. The hind wings are paler, semi-transparent, and without any markings. The body is about the same colour as the wings, the shoulder covers of the thorax being margined with brown on the inside. The male differs from the female in being rather smaller and in the antennæ being more pectinate.

The Spotted Halisidota Tussock Moth (Fig. 29), is a more conspicuous looking moth. The forewings are also ochre-yellow, but are spotted with blotches of dark brown, the outer of which forms a distinct band across the wing. The other blotches form four partial transverse bands, the 2nd, 3rd and 4th of which, in most specimens, join in the centre of the wing, forming one large blotch. The hind wings are the same as those of *H. caryæ*. The body is of much the same colour as the forewings, and just behind the collar are two oblique stripes, which converge and almost form a V-shaped mark. In width of wing expanse, this species averages slightly more than the first named species. The same differences occur between the males and females.

As mentioned above, the caterpillars of these two Halisidota Tussock Moths only appear late in the season, but, if another year they should again occur in such numbers on trees of value which it was thought should be protected throughout the whole season, they could, of course, be easily destroyed by spraying the trees with a poisonous arsenical spray, such as Paris green one pound, fresh lime one pound, water 160 gallons. In apple or other orchards which are regularly sprayed with the poisoned Bordeaux mixture, little injury would be done by these and many other kinds of leaf-eating caterpillars.

ADDITIONAL INSECT GALLS OF ONTARIO.

By Tennyson D. Jarvis, Ontario Agricultural College, Guelph.

In last year's Annual Report,* I gave an account of a considerable number of Insect Galls found in Ontario. Further collections and investigations have enabled me to add the following to the list:—

Diptera.

The Iris Leaf Gall. (*Agromyza magnicornis*) (Lowe).

An oval enlargement on the inside of the leaf, usually about 1 in. from the tip. Length ½-¾ in., width ½ in., thickness, ⅓ in. Surface green, like that of the rest of the leaf, except that it is somewhat whitened and withered in appearance. The interior is composed of loose, parenchymatous tissues separated from one another by many air cavities. In the centre is a single chamber about ⅓ in. long and ¼ in. in diameter. Where the gall occurs the leaf broadens, but above the affected part it becomes distorted and dwarfed. Larva, white. Pupa, dark brown. Occurs on the Blue Flag (*Iris versicolor*). Common.

Aspen Egg Gall. (*Agromyza æneiventris*, Fallen). Plate A., fig. 8.

This gall resembles in external appearance the Egg Galls of the willow

*Thirty-seventh Annual Report of the Entomological Society of Ontario, 1906, pages 56-72.

and Basswood, but sometimes it more nearly encircles the branch or twig. In form it is irregularly oval, about $\frac{1}{3}$ to $\frac{1}{2}$ in. long, $\frac{1}{4}$ to $\frac{1}{3}$ in. wide and $\frac{1}{3}$ to $\frac{1}{3}$ in. high. The texture is pit-like. The surface, at first smooth and like that of the bark, grows rougher as the gall matures. Polythalamous. The larvæ are greenish, about 3 mm. long and 1 mm. thick. It occurs, usually, singly but often with two united in a straight line, on the terminal branches of the American Aspen (*Populus tremuloides*). Fairly common at Guelph.

The Willow Potato Gall (*Rhabdophaga batatas*, O. S.) Plate A., fig. 7. An oblong ovate gall about 1 in. in length and $\frac{1}{3}$ to $\frac{1}{2}$ in. in thickness. The surface is irregular, but for the most part fairly smooth. The color is similar to that of the bark at first, but turns gray when mature. The texture is pith-like, but fairly hard. The gall is polythalamous. The larvæ are small and pinkish. It occurs singly usually, but sometimes with two or more in close proximity on any part of the twigs of the Scrub Willow (*Salix* sp.). Common.

Cock's Comb Hawthorn Gall (*Hormomyia cratægifolia*, Felt). Plate A, fig. 4.

This gall is very similar to the Cock's Comb Gall on the Elm (*Colopha ulmicola*). It is on the upper surface of the leaf and has the appearance of two tiny leaflets about 4-6 mm. high and 8-10 mm. long growing up parallel to each other but at right angles to the surface of the leaf. The upper margin of each is crenate usually, but sometimes the two leaflets coalesce at the top and become thickened in this part. They are green in appearance and of the same texture as the rest of the leaf. On the under surface, there is usually a considerable depression or groove on each side of the base of the gall. Of the infested leaves examined, none had more than two galls to a leaf. Monothalamous; contains a single white larva tinged with yellow. Occurs on the Hawthorn (*Cratægus* sp.). Rather rare.

Elm Leaf-fold Gall. (*Cecidomyia ulmi*, Beuten.) Plate A, fig. 1.

The gall takes the form of a pulpy thickening of the tissues in the under-surface of the leaf, extending for some distance along the midrib. It is usually near the base of the leaf, and causes the upper surface to double on itself instead of expanding in the ordinary way. The enlargement varies in length from about $\frac{1}{4}$ to1 in. and usually extends about $\frac{1}{4}$ in. on each side of the midrib. It is about 2 mm. thick. The surface is pubescent like that of the rest of the leaf, but is more or less irregular, with ridges and hollows, often appearing as though two or three galls were joined together. On the upper surface of the leaf the pocket found opposite to the enlargement on the lower surface contains several small white larvæ which have a slight pinkish tinge. The gall occurs on the American Elm (*Ulmus Americana*). Fairly common this year, 1907.

Balsam Fir Needle-Gall. (*Cecidomyia balsamifera*, Lintner). Plate A, fig. 3.

This is an irregularly oblong gall, situated near the base of the needle on the new growth. It encircles the needle, is about 3 mm. long, and from 1 to 2 mm. thick. The surface in most cases is smooth, though often somewhat corrugated, especially on the under surface. The color is a little paler green than that of the needle and the texture somewhat looser and more pulpy. The gall is monothalamous and contains a single orange-colored larva which (August 5th, 1907) had not yet begun to pupate. There is usually only one gall to a needle, but sometimes two continuous ones are found. Occurs on the Balsam Fir, (*Abies balsamea*). Rare.

Dogwood Leaf Gall. (*Lasioptera corni*, Felt.). Plate A, fig. 2.

Thin-walled circular elevations on the under side of the leaves of Cormus. Somewhat bladder-like in appearance, and sometimes occurring in

great numbers. A light-colored areola surrounds the gall which is monothalamous and contains a small larva which moves about quite actively when disturbed. Generally about .5 cm. in diameter. Not commonly distributed but, when found, occurring in great numbers. Late July and August. Found on Cornus sp. Common at Guelph.

Willow Joint Gall. (*Rhabdophaga nodulus*, Walsh). Plate A, fig. 9.

A rather small, irregularly, oval enlargement of the stem at the joints or nodes, about $\frac{1}{3}$ to $\frac{1}{2}$ in. in length and $\frac{1}{4}$ in. in diameter; the texture is woody; the surface smooth and like that of the bark; monothalamous. It occurs on the stem and branches of the Scrub Willow (Salix sp.). Fairly common at Guelph.

Hickory Cone Gall, (*Cecidomyia sanguinolenta*, O.S.).

This is a conical or sometimes almost spherical gall, situated on the under surface of the leaf along the veins. It is much constricted at the point of attachment with the leaf. Height about 4 mm., greatest diameter 3 to 4 mm., surface even, slightly pubescent, color at first red or purplish, later turning brown, monothalamous. The surrounding walls are nearly 1 mm. thick and of close, firm texture when mature. Numerous galls are usually found on a single affected leaf. They occur on the Sweet Hickory (*Carya alba*). Common in some localities.

Hickory Seed Gall, (*Cecidomyia caryæcola*, O. S.).

This is a conical gall with a fine, elongated tip. It is about 5 to 6 mm. in length and 2 to 3 mm. in greatest diameter, is smooth, pale green, turning brown in autumn, monothalamous; the enclosing walls are about .5 mm. thick, close and firm in texture when mature. It is found singly or in large numbers along the veins on the under side of the affected leaves of the Sweet Hickory, (*Carya alba*). Common in some localities.

Grape Vine Tomato-Gall, (*Lasioptera vitis*, O. S.).

"Consists of a bunch of irregular swellings of various rounded shapes. Soft, juicy and succulent. Yellowish green, tinged with red or entirely of this color. On stems and leaf stalks of Wild Grapes. May and June. Common." (Beutenmuller). I have not seen the gall myself, but it is reported from Ottawa by Dr. Fletcher, in the Report of the Entomologist and Botanist for 1887, page 29.

Bunch Gall on Willow. (*Rhabdophaga brassicoides*).

This is a gall of the same type as *Cecidomyia solidaginis*. It consists of a bunch of massed leaves which surround a small cell containing a yellowish larva. Growth having been checked at the end of the stem, this cluster of leaves has been formed. Occurs on Scrub Willow (Salix sp.). Not common.

Goldenrod Terminal Gall (*Asphondylia monacha*, O. S.).

This gall occurs at the tip of the plant and is a leafy conical structure $\frac{1}{2}$ to $1\frac{1}{2}$ in. high and $\frac{1}{2}$ in. in diameter. It consists of many leaflets clustered together and having their basal parts thicker than the part above. This thickened part forms the broad base of the cone, and the thinner part immediately above being incurved completes the conical structure. Above this conical foundation the tip of the leaflets extends to a greater or less degree and forms a sort of rosette. Between the thickened parts of the leaflets live from one to many small yellowish white, or in some stages almost orange, larvæ. The gall occurs on the Goldenrod (*Solidago Canadensis*). Common.

Willow Bud Gall, (*Rhabdophaga triticoides*, Walsh).

This gall seems to be an altered or transformed bud. The bud scales become elongated and the interior becomes a cavity in which the larva lives. The gall is about 5 mm. long, 2 mm. wide, and 1 mm. thick; the side against the stem is flattened. The color and surface are like those of the stem itself. Monothalamous. It occurs on the twigs of the Scrub Willow (*Salix* sp.) and

usually causes the stem to bend at the infested point. Common in some localities near Guelph.

Lunate Marginal Gall. (*Choristoneura flavolunata*, Felt). Plate A, fig. 6.

Circular or somewhat irregularly elliptical spot-like galls only projecting very slightly from each side of the leaf. They are about 1-5—2-5 inch in diameter, the main part of the spot is light colored (usually yellowish), this being enclosed by a dark ring, thus giving it some resemblance to an eye. The galls are glabrous and monothalamous, the larvæ feeding on the internal tissue of the leaf without causing much projection from within. Usually not more than 1 to 2 spots on each leaf. Occurs on *Solidago Canadensis*. Common at Guelph.

Blackberry Leaf Gall, (*Cecidomyia farinosa*, O. S.).

Consists of woody swellings at the base of the leaflets or on the midrib of the blackberry. The larvæ are purplish in color. Rare at Guelph.

Boneset Stem Gall (*Choristoneura perfoliata*, Felt.) Plate A. fig. 5.

Consists of oval swellings of the stems and leaf stalks. When mature, the enlargement is about twice the normal size of the stem. The gall is monothalamous and contains red larvæ. Fairly common at Guelph.

Spiræa Pod Gall (*Cecidomyia salicifoliæ*, O. S.).

The Pod Gall of the Meadow Sweet is found not only on *Spiræa salicifolia* but also on *S. tomentosa* and *S. betulæfolia*. It is quite similar in shape and appearance on all three, and in each it is found on the under surface of the leaf as stated in Entomological Report of 1906, page 68.

Golden-rod Gall (*Trypeta polita*, Loew).

Consists of a bunch of dwarfed leaves caused by the arrest of the growth of the branches. It is a little more than half an inch in length. The larva lives at the base of the gall. Fairly common at Guelph. On Golden-rod (*Solidago Canadensis*).

HYMENOPTERA.

The Large Spiny Rose Gall (*Rhodites multispinosus*, Gill). Plate B, fig. 3.

This gall, when mature, is oblong or sometimes ovate in shape, and is found on the stem and the branches. It averages 1 to 2 in. in length and $\frac{2}{3}$ to 1 in. in thickness in the widest part. The surface is covered with numerous spines or prickles about $\frac{1}{4}$ in. long and is light brown colored. The surface of the gall itself is somewhat rough and irregular, with depressions and elevations sometimes of considerable size. Moreover, after the gall-insects have emerged it is perforated with from 30 to 50 small, circular apertures, each about 1.5 mm. in diameter. The color of the gall is a dull gray. Its texture is firm, hard, brown colored, and granular. The gall is polythalamous, containing from 30 to 50 chambers, each about 3 to 5 mm. long and 2 mm. wide and arranged more or less radially along the longitudinal axis. When mature, the gall-insects make a tunnel from these to the surface. The adult insect is a Cynipid about $\frac{1}{4}$ inch long with reddish colored head, thorax and abdomen. The gall occurs on the Wild Rose. Rare; Niagara District and Toronto.

Cinquefoil Axil Gall (*Diastrophus potentillæ*, Bass). Plate B. fig. 5.

The gall is spherical or oval in shape, from $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter and about $\frac{1}{2}$ inch long, and is borne on a slightly curved peduncle 3-5 to $\frac{1}{2}$ inch long arising in the axil of the leaves. The gall is spongy in texture, with a solitary central chamber containing the white curved larva which is about 3 mm. in length. The gall is green in summer, reddish brown in winter. Occurs on *Potentilla Canadensis*. Rare in Eastern Ontario.

Blackberry Seed Gall (*Diastrophus cuscutæformis*, O. S.).

Consists of hard, woody, somewhat globular seed-like bodies 2 to 4 mm. in diameter. More or less covered with curved spines which are about 2 mm. long. Yellowish green or olive in color and borne in clusters on the stem, each gall containing one chamber. Rare at Guelph. Occurs on Blackberry (*Rubus villosus*).

Raspberry Stem Gall. (*Diastrophus turgidus*, Bass). Plate B, fig. 2.

A large reddish-brown polythalamous, tubercular or irregular gall, about 1 to 1.75 in. long and .5 in. in average diameter, arising abruptly on the stem. Green in summer, darkening towards winter. Chambers are very numerous, oval in shape, 1.5 to 2 in. in width and 2.3 in. deep. The gall has a number of prickles scattered over it which are about 2 to 3 mm. long, and appear to be enlarged stem prickles.

Oval Willow Stem Gall (*Euura S. nodus*, Walsh).

"A mere general enlargement of a twig from one-quarter more than its normal diameter up to twice its normal diameter, almost always without any abnormal roughness on the external bark, and not always confined to one side only of the twig. General color that of the twig. When cut into (August 28th), the interior of each gall is found to be pithy and to contain 1 to 3 larvæ in separate cells. Frequently on a piece of twig 6 in. long, 2, 3, or 4 of these galls are placed at irregular intervals. No appearance internally of any transverse plates or transverse fibres as in *S. ovum* and *S. ovulum*. Length .75 to 1.50 in., diameter .10 to .25 in. Very like the Cecidomyidous gall, *S. nodulus*, on the same willow (Proc. Am. Ent. Soc., Philada., III, p. 600) but is much larger, is polythalamous instead of monothalamous" (Walsh). The specimens found at Guelph were from .50 to .75 in. in length. The adults of any specimens examined on May 30 had emerged. Occurs on the Scrub Willow (*Salix sp.*). Common in some localities.

Rose Leaf Nipple Gall, (*Rhodites lenticularis*, Bass).

This is a small circular gall of about 3 mm. in diameter. The upper surface is practically on a level with the surface of the leaf and is pale green in color. It is characterized, however, by the presence of a little nipple in the centre, the nipple often being of a purplish shade. The under surface is slightly raised beyond the rest of the leaf and, unlike the upper, is purplish in color and has a slight depression in the centre corresponding to the nipple above. The galls occur singly or, more commonly, in groups, often covering the whole leaf and making its surface uneven. Found on the Rosebush (*Rosa* sp.). Rare.

Oak Wart Gall (*Andricus futilis*, O. S.). Plate B, fig. 4.

This is a rather small, wart-like gall situated in the parenchyma of the leaf and protruding beyond both surfaces, but chiefly beyond the lower. The protuberance on the lower surface is roughly hemispherical in form, averaging 4 mm. in diameter and 2 mm. in height. Its surface is often smooth and even, but quite often it is uneven or pebbly. The color is considerably lighter than the rest of the under surface of the leaf. The protuberance on the upper surface is much the same shape and nature, but is not so high as a rule, being usually only about 1 mm. in height. Its color is also lighter than the color of the surrounding part of the leaf, but darker than that of the under side of the gall. The walls of the gall are thin and much the same texture as the parenchyma of the leaf. The interior contains a kernel composed of two small oblong cells joined together along the side parallel to their longitudinal axis. Each cell has a small cavity within it containing a single, small, white larva. The adult insects emerged about July 30, 1907, and were small, reddish Cynipids. One to several galls may occur on a leaf. They

are found either on Burr or White Oak. (*Quercus macrocarpa* and *Quercus alba*). Common.

Burr Oak Leafy-wreath Gall (*Andricus topiarius*, Ashm). Plate C, fig. 6.

This gall resembles in external appearance the Goldenrod Bunch Gall (*Cecidomyia solidaginis*). It consists of a cluster of dense, narrow leaflets springing from a bud. When mature several small, brownish pupal cases about 3 mm. long and 2 mm. wide can be seen among the leaflets, attached at the base to the woody tissues below. The larvæ are minute and whitish. It occurs on the terminal twigs of the Burr Oak (*Quercus macrocarpa*). Common.

Oak Knot Gall (*Andricus punctatus*, Bass). Plate C, fig. 1.

This is a rough, hard, woody, somewhat globular, knot-like gall encircling the stem and varying greatly in size, but commonly 1 to 2 inches in diameter. The surface is ashy brown in color, and rough, with almost a network of little ridges and depressions. Polythalamous. It occurs on the branches of the Scarlet Oak (*Quercus coccinea*). Common.

Oak Seed-Gall (*Andricus seminator*, Harr.).

This is a woolly gall encircling the stem. It is irregularly oval, $\frac{1}{2}$ to $1\frac{1}{2}$ in. in diameter and $\frac{3}{4}$ to 2 in. in length. Polythalamous, containing many cream-colored cases attached to the twig, each case looking very like an oat seed. Early in the season the gall is white, but later it becomes brown. Occurs on the twigs of the White Oak (*Quercus alba*), Puslinch Lake. Rare.

Pine-cone Oak Gall (*Cynips strobilana*, O. S.). Plate C, fig. 4.

This gall is formed in the axil of a lateral bud just at the base of the terminal bud-cluster. When viewed from some little distance, it appears like a solid globular structure about $\frac{1}{2}$ in. in diameter, but when more closely examined it is found to consist of a rosette, or head of hard, brown, nut-like, wedge-shaped structures fitting closely to one another and attached at the base to a small spherical receptacle about $\frac{1}{4}$ to $\frac{1}{3}$ in. in diameter. Inside of each of these nutlets there is a single chamber, containing but one white larva. Occurs on the terminal twigs of the Burr Oak (*Quercus macrocarpa*). Common at Guelph.

Oak Fig Gall (*Biorhiza forticornis*, Walsh). Plate C, fig. 2.

A group of many small, soft, bladder-like, one-celled structures, each about 1-3 in. in diameter. These are often compared to a bunch or cluster of pressed figs, but seem to me to resemble more nearly the honeycomb of the bumble-bee, except that they are pale yellow in color, sometimes tinged with red, turning yellowish brown in autumn. They are arranged in a cylindrical cluster along the stem of the branches or twigs. The cluster is 1 to 2 in. long and $\frac{1}{2}$ to $\frac{3}{4}$ in. in diameter. The interior of each one of these bladder-like bodies is loosely filled with woolly fibres which keep in its position the small larval cell. Occurs on the twigs of the White Oak (*Quercus alba*). Common in some localities.

Empty Oak Apple (*Amphibolips inanis*, O. S.).

This oak apple gall is very similar in external appearance to *Amphibolips confluentus* (Harr.) but is considerably smaller and is quite dissimilar in its internal structure. It is found on the under side of the leaf, and springs from one of the main veins, is nearly spherical in form, about $\frac{1}{2}$—5-6 in. in diameter, and has a smooth, glossy, light brown surface when mature, which earlier in the season is green. The walls which enclose the almost empty interior are very thin, somewhat parchment-like and brittle. The small spherical larval cell within the cavity is about $\frac{1}{4}$ in. in diameter and

is held in position by a comparatively small number of filaments which radiate from it to the surrounding walls. It occurs on the Red Oak (*Quercus rubra*). Rare.

White Oak Club Gall (*Andricus clavula*, Bass). Plate C, fig. 3.

This is a club-shaped gall situated at the tip of the twigs. It evidently originates in the terminal bud-clusters, which it prevents from developing, though occasionally a few leaves grow out from the gall itself. When mature, it is ½ to 1 in. long, hard and woody in texture, a little darker in color than the rest of the bark, and somewhat grooved and ridged. Very often a second, or even a third, somewhat smaller gall is formed from the lateral buds immediately below. The terminal gall, in the cases examined, was dithalamous, the lateral ones monothalamous. It occurs on the White Oak (*Quercus alba*). Common in Muskoka.

Willow Petiole and Leaf-base Gall (Saw-fly)—*Pontania desmodioides* (Walsh).

This gall has the form of an oblong enlargement of the petiole, or often of the midrib of the leaf near the base. It is 8 to 15 mm. long and 4 to 6 mm. in diameter. Surface smooth and glossy, like that of the leaf; occasionally, however, it is somewhat rugose and irregular. The gall is solid and of a pulpy texture. It was monothalamous on July 8th, the date of discovery, the cavity being very small and containing a tiny greenish-white transparent larva with a brown head. Occurs on the Willow (*Salix lucida*). Rare, at Guelph.

Red Oak Gall (*Andricus papillatus*). Plate C, fig.5.

This gall is red and projects on both sides of the leaf. It is round and about 4 mm. in diameter. Above dark red, below yellowish. About three times the thickness of the leaf. On Red Oak at Puslinch Lake. July.

Spiny Ball Gall on Wild Rose leaf.

The gall described as *Rhodites bicolor* (37th Annual Report, page 70, Plate E, fig. 2), has been identified by Mr. Wm. Beutenmuller as *R. nebulosus*.

Lepidoptera.

Golden Oval Stem Gall (*Eucosma Scudderiana*, Clem.). Plate C, fig. 7.

This gall is situated on the stem and is oval in form, about 1 cm. long and 4 to 5 mm. in diameter. Its surface is similar to that of the stem, but the color is a little darker around the central part. It is pithy in texture and monothalamous. At the date of writing, July 24th, the chamber was small and cylindrical, and contained a single orange-colored larva. The galls are found either singly or often with two united and forming an irregular elongated enlargement. They occur on the Goldenrod (*Solidago* sp.). Common in Muskoka.

Hemiptera.

Plum Gall on Elm (*Pemphigus ulmi-fuscus*). Plate C, fig. 8.

This attractive looking gall occurs on the upper surface of the leaf and resembles in shape an unripe cherry or plum, there being an upper glossy green drupe-like part and a short stem connecting this with the leaf. The drupe-like part is slightly oblong in most cases and varies in length from 8 to 10 mm. and in thickness from 5 to 7 mm. The stem is from 3 to 4 mm. long and 2 to 3 mm. thick. The gall is monothalamous; a rather thin outer covering about 1 mm. thick and somewhat firmer in texture than the leaf encloses a large, round cavity, in which a single mother insect brings forth her brood of many young. The part of the leaf from which the gall springs is drained

of its nourishment and becomes whitish and roughened or blistered on both sides. Occurs singly on the leaf of the English Elm (*Ulmus campestris*). Rare.

Note.—There is a very similar gall on the Red Elm, but differing in the following respects: (1) It is twice as large; (2) Its texture is a little thicker; (3) The surface is rough, like the leaf, not glossy; (4) The part of the leaf around the base is quite normal in appearance, showing no signs of being weakened through lack of nourishment or any other cause. Probably the difference in the vigor of the two kinds of trees and in the character of leaf will account for these differences in the galls.

Hickory Hemispherical Gall (*Dactylosphæra hemisphericum*).

This gall is nearly hemispherical in shape, is formed in the parenchyma of the leaf, and the main part of it projects above the upper surface. It varies in size, being from 4 to 10 mm. in diameter and 3 to 5 mm. in height. The color is usually pale green, often changing to a reddish shade on most of the upper surface of the gall. After maturity the gall withers and becomes dark brown and dead looking, thus greatly disfiguring the leaf. The upper surface of the gall, before it has begun to wither, is slightly roughened by a few depressions and elevations. The under surface is of a paler color, being greenish-white. It does not project beyond the surface except at the small aperture, which is a slit about $\frac{1}{3}$ of the total diameter in length. Both sides of this slit project a little beyond the rest of the base of the gall and are reflexed so as to form a mouth-like structure. The gall is monothalamous. The walls are nearly 1 mm. thick and are somewhat hard and tough in texture. There may be only one or many galls on a single leaf. In most cases where they are abundant they seem to arrange themselves in rows along the midrib, often two deep on each side. Occurs on Shell-bark Hickory (*Carya alba*). Common.

Eriophyidæ.

Buttonwood Gall (*Eriophyes cephalanthi*).

This gall usually has the form of a number of small protuberances from 1 to 3 mm. high, which have coalesced at the base into one irregularly shaped cluster. The size and extent of a cluster varies greatly; sometimes a very small part of the leaf, less than one-eighth in some cases, is affected; at other times several large clusters are found on the same leaf, and occasionally the whole leaf is covered with galls. The galls are usually of a little paler shade of green than the rest of the leaf, but the top is often reddish in color. The texture is somewhat thicker and firmer than that of the leaf. The under surface of the leaf at the affected part is usually depressed, is rough and covered with a white pubescence. The gall occurs on the Buttonweed (*Cephalanthus occidentalis*). Common in Muskoka.

Ball Gall of the June berry (*Eriophyes* sp.). Plate D, fig. 1.

This is a small, nearly globular gall averaging about 2 mm. in diameter. It is found either singly or in clusters on any part of the upper surface of the leaf. On the lower surface the presence of the gall is indicated by a very small protuberance which is covered with a hoary pubescence. The main part of the gall, as seen on the upper surface, is dark brown in color, has a slightly roughened surface and is covered with a similar pubescence to the part on the lower surface. It is monothalamous. The walls of the chamber are thin (about 2 mm. in thickness), firm, and somewhat leathery in texture. The chamber is spherical. The gall is rather broadly attached to the leaf, the constricted part being about $\frac{2}{3}$ of the total diameter of the gall. It occurs on the June berry (*Amelanchier rotundifolia*). Rare.

The Unsightly Willow Gall, (*Eriophyes* sp.) Plate D, fig. 5.

This far-from-beautiful gall seems in most cases to spring from the axils of the leaves; occasionally, however, it is formed on the leaf itself. Often several galls are formed near the end of a twig. In these cases probably they started in the axils of the leaves which were subsequently absorbed into the galls themselves. Where the galls occur near the terminus of a twig, they are usually thickly clustered and encircle the stem, whose longitudinal growth becomes checked in such cases. The galls vary greatly in size and compactness of structure. Occasionally one is found that has the appearance of a small rosette, about ⅓ to 1 inch in diameter, composed of tiny, thickened leaflets covered with a whitish pubescence, the basal half of the leaflets being grown together and only the upper half being separate. In other cases a number of smaller galls are loosely clustered into one fairly large group, often an inch or more long. In other cases only a single diminutive gall is found. The galls, especially where loosely clustered, look considerably like the flower or fruit clusters of Lamb's Quarter (*Chenopodium album*), or like a very irregular whitish green fungus growth. In fall and winter they become grayish black and, where numerous, disfigure the tree considerably. They occur on the Scrub Willow (*Salix* sp.). Rare, except in a few localities.

Chestnut Leaf Gall (*Eriophyes*, sp.).

A small gall projecting from both sides of the leaf. When found along the side of the leaf-vein it is hemispherical, elsewhere is more or less spherical. The diameter is about 2 to 3 mm. Somewhat the larger half of the gall is on the upper surface. The color at first is green, but turns brown when mature. Monothalamous. Occurs on the Chestnut (*Castanea sativa*). Common.

Convex Gall of Poplar (*Eriophyes sp.*). Plate D, fig. 3.

This gall has the shape that one imagines would be formed if he were to press the tip of the little finger, or of some round instrument, against the lower surface of the leaf and, without breaking the tissues, were to cause them to yield until there was a decided depression on the lower surface and a corresponding bulge on the upper. There is practically no thickening of the tissues of the leaf or change in color except that the under surface of the gall is orange yellow. The depression varies in size, being about 4-12 mm. in diameter and 2-5 mm. in depth. Occurs on Lombardy Poplar (*Populus dilatata*). Rare.

Walnut-leaf Wart Gall (*Eriophyes sp.*).

A warty protuberance chiefly on the upper surface of the leaf, constricted at the base, about 2-5 mm. high and 2-3 mm. thick in its widest part; surface usually very uneven with many depressions and elevations; color green; texture of outer part somewhat pulpy but most of the interior is composed of a mass of loosely woven silvery fibres or strands. This gall resembles greatly the Elm-leaf Wart Gall (*Eriophyes ulmi*), but has a rougher surface at the top and is not frequently found on the under surface of the leaf. Occurs on black walnut (*Juglans nigra*). Common.

Walnut-Cushion Gall (*Eriophyes sp.*). Plate D, fig. 2.

Large and somewhat cylindrical in outline. Found on the lower portion of the petiole (in some cases the pulvillus is affected). A green solid swelling clothed by a dense fur-like covering of short reddish hairs about 1 mm. in length. The galls usually appear on the upper side of the petiole, with the edges overlapping. 8-10 mm. long and 4-8 mm. broad, but varying considerably in size. On black walnut (*Juglans nigra*).

Unsightly Poplar Stem-gall (*Eriophyes sp.*).

This is one of the most irregular and unsightly of all our galls. It is found on the stem of young twigs though sometimes it extends to the basal

part of an adjoining leaf or leaves. It seems always to start in the axil of a leaf. The stem gradually thickens at the affected part to almost three times its normal size and does not continue to elongate in this part as it does above and below it; so that in a space of 1 to 2 inches where we should normally find not more than four leaves, we here get eight or nine, some of them dwarfed and distorted. Moreover the stem at this point, instead of growing straight out in its normal direction, often becomes distorted and bent in another direction, sometimes nearly at right angles to its former course, and then coming back to its first direction grows on parallel to it. The gall itself looks like a very irregular tubercular mass of closely packed small reddish-green protuberances about ¼ inch high. These irregular masses in some places encircle the stem, in others are chiefly on one side of it though often extending to the basal part of the leaves. Sometimes the masses are so close as to be continuous, at other times they are ¼ inch or more apart. The whole of the affected part of the stem is usually from ½ to 1¼ inches in length, and the irregular mass when surrounding the twig makes the total diameter ½ to 1 inch. Later in the season and during the winter the gall is black and the part of the stem above it in most cases dies. There is usually but one gall on a stem, but sometimes a second or third occurs at some distance below it. This gall is somewhat similar to what I have called the unsightly Willow Gall, described above. It occurs on the American Aspen (*Populus tremuloides*). Rather rare.

Speck Gall of Chokeberry (*Eriophyes sp.*)

This gall, as the name indicates, is a very tiny, speck-like structure, usually much smaller than the head of a pin but occasionally a little larger. It is visible equally on both sides of the leaf and, when mature, is of a brown color. In none of the numerous specimens observed did it extend more than .5 mm. beyond the surface. The gall resembles very much a species of Eriophyes gall found on the hawthorn. Numerous galls, scattered here and there throughout the parenchyma, are usually found on each infested leaf. They occur on the chokeberry. (*Pyrus melanocarpa*). Common in Muskoka.

Grape Leaf Wart Gall (*Eriophyes sp.*).

This is a small semi-circular, or sometimes nearly circular, wart-like gall situated along the veins of the leaves. It is about 2 mm. in diameter and only very slightly elevated beyond the plane of either surface of the leaf. The upper surface is fairly smooth and slightly paler in color than the rest of the leaf. The under-surface is of much the same color and kind of surface as the underside of the leaf, but it has a tiny white nipple in the centre, and around all the gall, except the part touching the vein, there is a distinct depression or furrow. There are often several galls on a single leaf. They occur on the Wild Grape (*Vitis cordifolia*).

Pin Cherry Gall (*Eriophyes sp.*).

Oblong or club-shaped, reddish projections scattered over the leaves, somewhat irregular in outline and pubescent, 3-4 mm. long .5-1 mm. diameter, being broadest at the top. Generally borne on a little curved peduncle-like portion which is about 1 mm. long and lighter in color.

In conclusion the writer desires to express his thanks to Dr. E. Porter Felt, Mr. William Beutenmuller, and Prof. Bethune who have most kindly aided in the preparation of this paper. Especial recognition must be given to Mr. L. Cæsar, who has assisted in describing many of the species. I am much indebted to Mr. W. R. Thompson and Mr. C. D. Jarvis, who have furnished the photographs for this paper.

INJURIOUS INSECTS IN ONTARIO IN 1907.

By C. J. S. Bethune, Ontario Agricultural College, Guelph.

Owing to the prolonged cold weather during April and May the season of 1907 was remarkably backward and the appearance of our common insect pests was much later than usual. Many kinds were no doubt greatly reduced in numbers by the change from very warm days during the last week in March, which caused them to come out of their winter quarters, to the abnormal cold of the following two months. A drop of 50 degrees of temperature between the 29th of March and the 1st of April must have been a severe trial of the vitality of the early appearing species and large numbers must have succumbed to it. But notwithstanding these losses, most of our familiar insects were to be found during the season, while some were conspicuous by their absence. Among the latter may be mentioned the Squash-bug (*Anasa tristis*), which has entirely disappeared in this part of the province, though one of our most abundant pests only a few years ago. The season was marked by one great outbreak of the Variegated Cut-worm, a full account of which is given in another part of this report.

Fruit-Tree Insects.

Among insects affecting fruit, none has been more complained of this year than the codling-moth, which has taken its heavy toll from orchards throughout the fruit-growing districts. The greatest amount of damage has been inflicted in those localities where there is a second brood of the worms. Careful spraying twice in the spring with poisoned Bordeaux mixture followed by the prompt removal of all fallen fruit, should reduce the second brood to a minimum, and what survives may be successfully dealt with by bandaging the trees from the middle of July, and destroying regularly the worms that take refuge under them. These operations certainly involve much trouble and expense, but it has been many times proved that they pay well in clean marketable fruit and plenty of it. There are still some points in the life history of the codling-moth about which we continue in doubt and many careful observations in different localities are required to clear them up. Recent discussions among our most practical fruit growers show that interest in these matters has been awakened, many various opinions have been expressed and painstaking investigations may be expected. Any positive results will, no doubt, be made known at once.

Another insect that threatens to spread over the province is the Apple Maggot (*Rhagoletis pomonella*), which is quite as injurious to the fruit as the codling-worm. In the central part of the State of New York, in Connecticut and Vermont, and as far north-east as Maine, this is now a most serious pest. In many localities it is impossible to find an apple free from the attack, which spoils the appearance of the fruit and renders it worthless. So far we have only seen specimens in this country from the neighborhood of Bowmanville, and Dr. Fletcher last year recorded its presence in injurious numbers in the county of Prince Edward. Having now obtained a foothold, it is to be feared that its range will soon be extended over a wide area, and that fruit-growers will have another just cause for lamentation. The damage is caused by a small white slender maggot, which burrows in all directions through the fruit, turning the flesh brown wherever it goes; it takes about six weeks to mature and then it usually causes the fruit to fall, in which case it leaves the apple and enters the ground. The parent is a small, two-winged fly, prettily marked with bands and with

golden eyes. The female punctures the fruit with her ovipositor and inserts the egg beneath the skin, consequently spraying with any poisonous mixture is of no avail. The emergence of the parent flies and their egg-laying is very irregular and may take place at any time during the summer and even when the fruit is fully formed. When this is the case apples apparently sound when picked may later on become worthless from the working of the unsuspected maggot within. Thus it may be seen that this is a very serious pest and most difficult to deal with. The only remedy so far known is to destroy all fallen fruit without delay; this should be done daily in order to give no time for the maggots to escape into the ground. The cheapest and most effective plan is to let growing pigs have the run of the orchard: they will keep the ground clear of fallen fruit and will thus devour both these maggots and the codling-worm as well

Scale Insects. An unusually large number of enquiries have been made this year respecting scale insects and a number of different kinds have been received for identification. This does not necessarily mean that these insects have been more abundant than in previous years, but rather that fruit-growers have paid more attention to them and are realizing what dangerous enemies many of them are. The Oyster-shell Bark-louse (*Lepidosaphes ulmi*) was the species most commonly sent in; its range extends all over the province and its injuries are so apparent that they cannot escape the notice of the most careless owners of orchards. Twigs completely encrusted with the scales were received from many correspondents, showing the severity of the attack and the failure to employ any remedy. Not only do these scale insects drain out the life of the tree through the beaks of innumerable hosts, but they at the same time so weaken the vitality of the twig or branch, and eventually the whole tree, that it readily becomes a prey to canker and fungus diseases and the onslaughts of borers which only affect the sickly and the dying. Happily the remedy is simple, cheap and easy of application—lime-wash (one pound and a half of quickly slaked lime to a gallon of water) should be applied to the trees after the leaves fall in the autumn. The spraying must be thoroughly done from the highest twig to the base of the trunk so that every portion will show up white,

A second application a week or two later or before the buds open in the spring will complete the job and clear the tree. As a matter of precaution it will be well to repeat the operation during the following year. We have found many scales destroyed by a minute parasitic insect, and in some instances a fungus growth has killed the whole colony.

The San José scale is gradually spreading from its original centres of infestation in the Niagara district and Kent and Essex counties. In the former it is extending its range westward along the lake shore country towards Hamilton, and in the latter it has been found as far east as Aylmer in the county of Elgin. This spread of the insect is entirely due to the carelessness, indifference or ignorance—and perhaps indolence—of a large number of owners of fruit-trees who will not take the trouble to cut down and burn dying trees or to spray all those that are in any degree infested. The lime-sulphur wash is a complete remedy, but it must be properly made and thoroughly applied. If universally employed wherever the San José scale is to be found, it would not take many years to entirely get rid of the pest.

Several other scale insects have attracted attention, but none of them have become serious pests. There is always, however, a danger that some one or more of them may develop, if neglected, into a menace to the fruit-trees they attack. The Scurfy, Terrapin, Putnam and Forbes scales are those which have been chiefly noticed. The lime-sulphur wash, followed by kerosene emulsion when the lice are moving in early summer, will keep

these scales in check. Their presence should be looked for on Hawthorns, Mountain-ash and other trees as well as those grown in the orchard or garden.

Among other insects affecting fruit-trees that were noticeable during the past season may be mentioned the Shot-hole borer or Fruit-tree Bark-beetle (*Scolytus rugulosus*), which was somewhat abundant in the Niagara district. It especially attacked cherry-trees, on which its presence was make known by exudations of gum. This small beetle does not as a rule affect healthy trees but only those that are sickly and dying, and is often found on limbs whose vitality has been weakened by scale insects. The only available remedy is to cut off and burn all limbs that have been attacked; dying trees should be removed and all brushwood from prunings burnt.

The usual perennial insects, that are more or less abundant every year, made their presence felt this year also, such as the plum curculio, the eye-spotted bud-moth, pear-tree slug, tree cricket, rose chafer and the grape-vine flea-beetle. Fuller information regarding these insects and how to deal with them may be found in a recent bulletin by the writer on "Insects affecting Fruit-trees" issued by the Ontario Department of Agriculture.

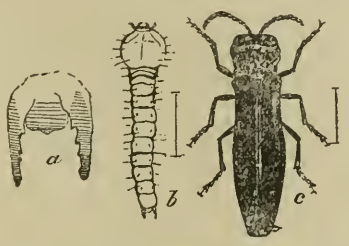

Fig. 30. Red-necked Agrillus; *a* anal processes; *b* larva; *c* beetle—much enlarged.

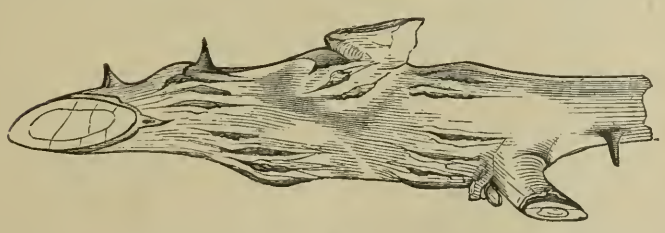

Fig. 31. Raspberry Gouty-gall caused by the Red-necked Agrilus.

Market gardeners in the neighborhood of London complained very much of an attack upon their raspberry bushes, which proved to have been made by a small beetle, the Red-necked Agrilus (*A ruficollis*). Fig. 30*c*. Portions of the canes were found to be much swollen in the form of a roughened pithy gall which rendered them liable to break off, or to dry up and die. Fig. 31. The beetle, which is about two-fifths of an inch in length, is slender in shape with a dark bronzy head, a bright coppery thorax and dark brownish wing covers. It lays its eggs on the canes in July and the grubs, which soon hatch out, burrow into the wood and by the irritation they produce in the plant-tissue cause the enlargement referred to, which is called the Raspberry Gouty-gall. The grubs are slender and thread-like, with a flat head, Fig. 30*b*, and live in the canes till the following spring, when they change to the chrysalis stage and later on appear as beetles. Cutting out and burning all affected canes is the only available remedy.

Insects of the Field and Garden.

With the exception of the outbreak of the Variegated Cutworm, elsewhere referred to, which bored holes in green tomatoes and destroyed many kinds of vegetables and flowers, there is little to report this year concerning garden insects. The tarnished and four-lined bugs, the asparagus beetles, the cucumber beetles and the turnip and onion maggots, described in last year's report, were to be found almost everywhere, but in greatly reduced numbers on the whole. Apart from Cutworms, there were few complaints from correspondents respecting our usual enemies.

Numerous requests were made for remedies against wire-worms and white-grubs. Unfortunately there is no practicable method of dealing with these underground root-feeders by poisons of any kind. The only remedy is a system of rotation of crops, by which the pastures are broken up and land is not left for a number of years in sod. Deep ploughing in the autumn brings the grubs to the surface and breaks up the pupal cells in which they are transforming to beetles; by this means the exposure to the weather and to the attacks of their natural enemies, such as birds, etc., will get rid of large numbers of them.

Owing to the unusually dry summer grasshoppers throve and multiplied to such an extent that they became a veritable plague in some localities, and inflicted a large amount of damage to oat crops, grass lands, etc. The breaking up of their breeding places by ploughing up old dry pastures and stubble fields where they have laid their eggs is a useful method for the reduction of next year's brood. When the insects are abundant in August, much may be done to get rid of them by using what is called the "Criddle mixture." This is made by taking half a barrel of fresh horse manure and mixing with it two pounds of salt dissolved in half a pail of water and one pound of Paris green. The whole should be well stirred up and then scattered by means of a trowel or piece of shingle wherever the grasshoppers are to be seen, the insects will devour this in preference to any other kind of food and be poisoned in large numbers.

Plant-lice (*Aphis*) of various kinds were excessively abundant this year, especially during the latter part of the summer and early autumn, the dry season having been favorable for their multiplication. The most serious attacks were made upon turnips and cabbages during the month of September, when complaints and enquiries came in from many parts of the province. The standard remedies for these minute insects are the contact poisons, viz., kerosene emulsion, whale-oil soap and tobacco washes. After the crop has been removed the loose leaves and stalks of the cabbages and the tops of the turnips should be taken away and the ground ploughed up; this is done to destroy the eggs, which are laid on stalks and foliage before winter sets in.

Some alarm was caused in various quarters by the newspaper reports of "the Green Bug," which was said to be inflicting enormous damage upon the wheat and oat crops in the southern and middle western States. By this name was meant a green plant-louse (*Aphis*), which is sometimes troublesome to us in Ontario. As a general rule, however, it is kept in check by its natural enemies, the lady-bird beetles and other predaceous and parasitic insects. Occasionally these are insufficient to control the pest and it becomes so abundant that it causes a vast amount of damage to the crops. This seems to have been the case in the regions referred to.

The oat crop this year was affected by a serious blight which was manifested by the leaves turning yellow and withering away. Many farmers thought that this was caused by "the Green Bug" and sent in specimens for examination. A few were found to be infested with a plant-louse (*Aphis*),

which sucks out the sap of the plant and greatly reduces its vitality; in these cases the blight might be caused by the insects' attack. But in the majority of examples which we have received and examined there was no trace of any injury by insects nor of any fungus disease. Specimens examined at the Bacteriological laboratory were also found to be free from any disease of a bacterial character. The conclusion was therefore arrived at that the blight was due almost entirely to atmospheric conditions, namely, late frosts in some localities, and in others cold, almost frosty, nights succeeded by bright, sunny days. The very late season evidently contributed to the injury, as the crop generally did not possess the vigor and vitality which would enable it to withstand the effects of occasional unfavorable weather.

REMARKABLE OUTBREAK OF THE VARIEGATED CUTWORM.

By C. J. S. Bethune, Ontario Agricultural College, Guelph.

On the evening of the 25th of July, a telephone message from Leamington was received at the Ontario Agricultural College urgently asking for help against a worm that was devouring everything before it. As no information was supplied that gave any clue to the identity of the depredator, an arrangement was at once made by the Department of Entomology to send to Leamington Mr. Cæsar, a fourth year student, and Mr. McMeans who is in charge of the vegetable gardens. They left the next morning and on the following evening Mr. McMeans brought me back specimens, which proved to be the Variegated Cutworm (*Peridroma saucia*), and gave me an account of the ravages of the insect and the advice that was given to the farmers whose crops

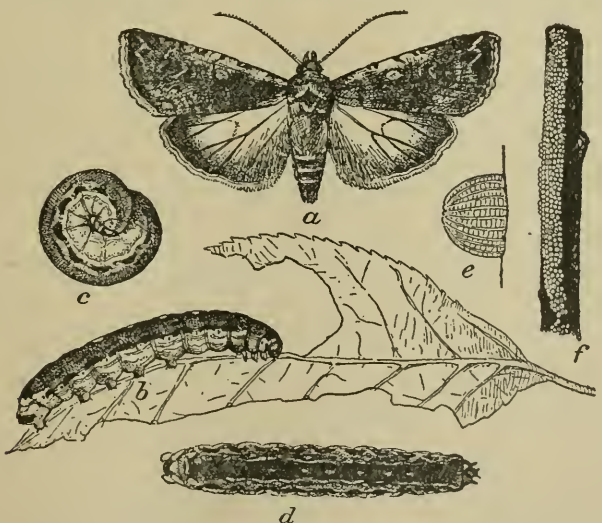

Fig. 32. *Peridroma Saucia* ; *a*, moth ; *b*, normal form of larva, lateral view ; *c*, same in curved position ; *d*, dark form, dorsal view ; *e*, egg from side ; *f*, egg mass on twig (after Howard, Division of Entomology, U. S. Dept. Agriculture).

were being attacked. Mr. Cæsar, who remained longer, subsequently gave me the more detailed report which is appended hereto. The outbreak is very remarkable, as nothing similar has been recorded since the year 1900, when these cutworms appeared in enormous numbers in British Columbia and the neighboring Pacific Coast States and were unusually abundant in

Manitoba, Ontario, and many of the States to the south-west of us. Dr. Fletcher, in his annual report for 1900 (pages 215 to 227), gives a very full account of the insect and its ravages in British Columbia during that year.

Near Leamington the worms were first observed in clover fields, where they soon devoured the crop and left the ground bare and black; they then marched on to the next field and consumed whatever vegetation they met with; corn and tobacco, tomatoes and other vegetables seemed especial favorites for consumption. If a fruit tree happened to be in their way, they climbed it and devoured both fruit and foliage; many peach trees were thus attacked and the fruit ruined.

Like other cutworms these caterpillars feed only at night and remain in concealment during the day, hiding in the ground where the soil is loose, and under any rubbish or other shelter that they can find. When full-grown the worm is about two inches long, with a yellowish stripe on each side above the legs, the rest of the body is darker and mottled with black, white or grey; the most characteristic feature is a row of yellow or white spots, five to seven in number, along the middle line of the back. Fig. 32. Some of the worms changed into the chrysalis stage early in August, others later; for this purpose they buried themselves in the ground and formed there an oval earthen cell. The moth, into which they finally turned, has a wing expansion of about an inch, and is dark blackish brown in color, often clouded with red towards the front margin of the wings, but with no conspicuous or distinguishing markings; the underwings are white with a pearly lustre. Like so many other of our most destructive insects, this one has come to us from Europe.

Report by Mr. L. Cæsar to C. J. S. Bethune, Professor of Entomology.

Sir,—I have the honor to submit the following report of my trip to Leamington, July 26th to 29th, to aid the farmers in their struggle against an insect pest that seemed to be devouring everything before it.

I arrived at Leamington about sunset, July 26th, and at once set out for the farm of W. T. Moore, who was the first to propose sending to your department for aid. By the assistance of a lantern we were able to see the caterpillars at work on Mr. Moore's tobacco and tomatoes. They proved to be the Variegated Cutworm (*Peridroma saucia*) and were very numerous, Mr. Moore on one occasion counted as many as 250 on a single plant. They had begun their ravages in a small plot of second growth clover which he was keeping for seed. To check them Mr. Moore at once plowed this down and rolled it, thereby no doubt destroying countless numbers; but many still remained. Finally, in his efforts to keep them from destroying his tobacco and tomatoes he had hit upon the device of plowing a furrow ahead of them. This, in a very sandy soil like his, gave excellent results and impeded the progress of the caterpillars better than one would have thought possible, especially as they climb corn stalks and trees without difficulty. The fine grains of sand, however, yielding as they tried to climb, made an insuperable barrier in most cases. I recommended Mr. Moore to make holes with steep edges and about one foot deep at intervals of about every twenty feet in the furrows. Next morning I had a chance to see the work of the furrow and holes combined on an adjoining farm. The result was most gratifying to all of us. In every hole there was a mass of caterpillars an inch or more deep. The farmer went from hole to hole with a piece of fence rail about five feet long and pounded his foes in each hole to death, evidently taking much pleasure in the operation.

Though I saw that very few caterpillars had been able to escape from the furrow and holes, yet as an extra precaution I advised that the uninjured plants immediately in front be sprayed with a strong mixture of Paris green and water, or that poisoned bran be scattered among them. Mr. McMeans of the Horticultural department, who was with me, suggested shorts as an alternative for bran.

After arranging to come back in the afternoon and superintend the preparation of the poisoned bran or shorts, I was driven by Mr. Moore to several other farms which were reported to be attacked by the same pest. Of these one belonged to Mr. Quick. This gentleman, the night before I came to Leamington, had lost more than an acre of good tobacco by the attack of caterpillars. Practically nothing had been left of it. Having heard, however, of the furrow plan, he at once ploughed one and the next night was delighted to observe by the aid of his lantern that it seemed to be an effectual barrier. I mentioned a few ways in which I thought Mr. Quick could improve his furrow and also told him of poisoned bran or spraying with Paris green as further remedies. There was evidently a good deal of scepticism in his mind and in the minds of some other farmers as to the efficacy of Paris green in any shape or form. Probably this was because they did not see dead caterpillars lying on the plants or on the ground where they had tried spraying. They could scarcely be expected to think of their having buried themselves and died in the ground. However, I told them to come down and see how the experiment with the poisoned bran resulted at Mr. Moore's.

The next farm visited belonged to Mr. Copeland. Here I saw the most discouraging sight I had witnessed anywhere in the district. From several acres of clover the caterpillars had spread out in a single night and attacked in enormous numbers about two acres of beautiful corn and ruined it. Not only had they attacked the leaves but they had eaten through and through the stalks themselves. In addition to the corn they had attacked two rows of peach trees that were about three years old. If one of these trees were given a quick shake numerous caterpillars would fall from their hiding place among the foliage to the ground. Here again Mr. Copeland, having heard of the furrow and holes had resorted to this device to save the rest of his crop. It was interesting to see the host of caterpillars in the large holes he had made. So strongly did he trust to his furrow and holes that he was leaving to sun to do the work of destroying the caterpillars for him. Practically none seemed to be escaping, but I advised their immediate destruction in whatever way he wished, whether by boiling water, by kerosene, or by pounding with a stick as his neighbor had done.

Several more farms were visited and the best remedies I knew of explained to the farmers, many of whom had no idea of what they ought to do.

On my return to Mr. Moore's in the afternoon I helped him to make up what little bran he had into a poisoned mixture. The method I employed was to sweeten some water with black-strap, then moisten the bran with it and add the Paris green little by little to the moistened bran, mixing it thoroughly. I believe that a better and easier way would have been to make a paste of the Paris green with a little water and then add this gradually to the moistened bran and mix thoroughly. The trouble with the former method was that in spite of every precaution the Paris green tended to form flakes and could with difficulty be got to mix up finely with the bran. It was impossible, however, to get any more bran or shorts in the town, so we used flour and Paris green, mixing them dry. This was put on by means of a Planet Junior hand-drill, a very convenient method. Mr. Moore pro-

mised to observe by lantern light the results of our experiments with the bran and flour mixtures respectively. So after watching some spraying of hedges around a clover field, I returned to the town.

Late that night Mr. Moore met me in town and seemed very much pleased with the experiments. He reported the poisoned flour a decided success. He had less to say about the poisoned bran.

Illness during Sunday, July 28th, prevented my visiting any of the operations which I heard were going on all that day. A few farmers, however, met me and made enquiries how to fight the pest. At the request of several of the most intelligent farmers, I arranged early Monday morning for the publication and distribution of 1,000 leaflets giving instructions how to combat the caterpillars. Having seen to this and visited two infested farms where I saw that the foe was still under control I felt compelled by continued illness to return to Guelph at once.

It may be of interest to note that on at least two farms large flocks of cowbirds were seen feeding upon the caterpillars. I looked for signs of Tachina flies and other parasites, but saw none attacking the caterpillars; these were, however, great numbers of cocoons of Braconids to be found on the clover leaves. I brought some of these home and reared several adults from them.

Respectfully submitted,

L. Cæsar.

TWO-WINGED FLIES.

By Rev. Thos. W. Fyles, D.C.L., F.L.S., Levis, Que.

Two-winged flies seem to be everywhere in evidence. They are met with as far north as man has made his abode; and they abound in tropical regions. In light or darkness, be the weather fair or foul, in early Spring and late Autumn—aye, and under favorable circumstances in Winter also—two-winged flies are to be found.

Baron Osten Sacken, in his "Catalogue of the described Diptera of North America," gives the names of no less than 4,077 species of these insects; and doubtless there are many more unnamed species, belonging to the order, that will be found as time goes on and dipterologists increase. The same distinguished naturalist groups the flies into 64 families. It may well be believed that such formidable numbers are deterrent to the study of the Diptera.

Moreover, there is, I think, a prejudice, formed in early life, against the two-winged flies. The annoyance caused by house-flies, gnats, and cattle-flies, the abominable character of the blow-fly, the accounts of the *tsetse* and other hurtful species, all tend to create an utter dislike to the Diptera that is hard to overcome. I know that as a boy I was not much impressed by the story—told as a warning—of the ill-famed and ill-starred Roman Emperor who amused himself by killing flies. Questions arose in my youthful mind as to whether, in so doing, he was not acting as a public benefactor; and I am inclined to think that many a mother who in the nursery, would tell her children not to be cruel and kill flies, would, in the kitchen, spread a sheet of "tangle-foot" without compunction.

Yes—the order Diptera is not generally regarded with favor. Nevertheless, as Mr. Macy says in *Silas Marner*, "a fly is a fly, though it may

be a hoss-fly,* and the habits of even this depreciated "hoss-fly" are so remarkable and its life-history is so strange, that, duly observed, they cannot fail to interest.

Undoubtedly many of the two-winged flies cause annoyance, both to man and beast; some are highly destructive to our food-supplies; some, on the other hand, are useful in keeping down the numbers of other insects, and others again, in consuming animal and vegetable substances that would cause harmful exhalations.

I shall endeavour to guard against wearying my readers with minute descriptions of many species. I hope to kindle an interest in the Diptera by telling of peculiarities in the structure and habits of some of the more remarkable of the kinds that have come under my notice.

The first family in Osten Sacken's list is the *Cecidomyiidæ* a very important group of insects. In it come two of the worst insect pests that have troubled the Agriculturist, viz., the Hessian Fly (Fig. 33), *Cecidomyia destructor*, Say, and the Wheat Midge, *Diplosis tritici*, Kirby (Figs. 34 and 35).

Fig. 33.—Hessian Fly —greatly magnified.

Fig. 34.—Wheat Midge—natural size shewn below.

Fig. 35.—Wheat Kernel attacked by Midge.

Fig. 36.—Willow-gall Midge—*a* the fly, much enlarged, *b* antenna highly magnified.

Fig. 37.—Diplosis grassator—1 larva, 2 pupa, 3 fly, side view, 4 fly, under side (original).

Of *C. destructor*, two broods appear in the year—one in May, the other in September. Each female fly lays about 30 eggs, on the blades of wheat, or of some other kind of grass. The eggs are minute, cylindrical, red points.

*"And you're a doctor, I reckon, though you're only a cow-doctor—for a fly's a fly, though it may be a hoss-fly," concluded Mr. Macey, wondering a little at his own "cuteness."—*Silas Marner*, ch VII

They hatch in a week if the weather is warm; and the little white maggots work their way down between the leaf and the stem of the plant, till they come to a joint; there they commence to drain away the juices of the plant. About the first of June, the maggots go into what is called the "Flaxseed stage," because of the shape and color of the pupa case, or "puparium." The perfect insects appear in August, and lay their eggs for the second brood. Where Fall Wheat is grown it should not be sown till September; and Spring Wheat should not be sown till the end of May.

Diplosis tritici became very destructive in Lower Canada in 1834. In 1856 it was estimated that the loss on wheat in Canada, occasioned by the Midge was $2,500,000. The perfect insect is a minute, orange-colored fly, with black eyes, yellow legs, and wings that resemble thin films of mica. It makes its appearance when the wheat is in flower; and the female lays her eggs in the floret—the harm done by this insect is directly to the kernel (Fig. 35). The maggots get their growth in three weeks, and then wriggle to the ground and bury themselves, remaining unchanged through the Winter, and going into pupa in the Spring. The flies come forth in the end of June. Because of the damage done by this insect, and because Western flour can be bought so cheaply, our farmers in Quebec Province have, very generally, abandoned the growth of wheat.

A very interesting Cecidomyian is *C. strobiloides*,, Osten Sacken (Fig. 36). This fly lays an egg in the terminal bud of a shoot of sallow. The little orange-colored grub that comes from the egg so affects the bud, that it develops into a good-sized cone-shaped gall, which becomes dry and hard as the Winter advances. In the centre of this gall, and in a delicate, membraneous cocoon, the grub remains till early Spring, when it changes to a pupa. In April or May the perfect flies appear. When I was studying these creatures I opened some of the galls to watch the changes of the insect, and, as I thought, to aid the prisoner to escape, but the interference did harm; the fly from the open gall was always defective—as we say "crippled." It seemed as if the effort on the part of the insect to work its way upward, was absolutely necessary to the attainment of its higher life. And in this we have one of Nature's many parables.

A fly of great economic importance is *Diplosis grassator*, Fyles (Fig. 37), which in this country preys upon and keeps down the numbers of the dreaded *Phylloxera vastatrix*, Planchon.

The story of my discovery of this insect is as follows:

In the summer of 1882, I spent some time at Como, on the Ottawa with my friends, Mr. and Mrs. I. J. Gibb. Growing over the fences of the highway which ran through their estate, and extending for many yards, were several native vines. They were badly infested with *Phylloxera vastatrix*. As this pest was then exciting much attention, I was pleased with the opportunity of studying its habits. I soon found that at this place it was assailed by a formidable foe, an orange-colored dipterous larva. The business-like way in which this creature gave the *quietus* to the larva of the Phylloxera aroused my curiosity, and I resolved to study the species carefully. Accordingly I took a mass of the affected foliage home to Cowansville, where I then resided, and arranged for fresh supplies, properly secured, to be sent to me by post. At home I spent much time at the microscope, observing the structure, habits, and metamorphoses of the species; and I made, with the utmost care, drawings of it in its larval, pupal, and imago stages.

The Annual Meeting of the Entomological Society of Ontario was held that year in Montreal, and was attended by a number of scientists from the

United States. Among them were Professors Lintner, Hagen, and Riley. I brought the insect under the notice of the meeting. No one present professed an acquaintance with it, except Dr. Wm. Saunders (see 13th An. Rep. Ent. Soc. of Ont. p. 10); but Dr. Riley, from the description given, and the specimens shewn, pronounced it to be a species of Diplosis.

I then wrote to Dr. Williston, sending him particulars, and asking him for information He very kindly replied, furnishing me with references to a number of species of Cecidomyia, and adding:

"It is probable that your species is not one of these, but new. Still I should examine the subject as far as possible. At all events its life's history is interesting, and worthy of immediate publication. *L. vitis* is the only species in which the imago and complete life history are known."

Acting upon Dr. Williston's suggestion, I sent the life-history of the insect, with illustrations to the "Canadian Entomologist."

They appeared in the December number of the magazine (Can. Ent. Vol. XIV, p. 237), together with a confirmatory statement from Dr. Saunders, the editor. The number was printed January 10th, 1883.

On the 27th of February, 1883, I received a kind letter from Dr. Hagen, who said, with reference to *D. grassator*—specimens of which I had sent him: "The fly is, I think, a Cecidomyia. I think it is not sure that it belongs to Diplosis. At least the reticulations of the wing differ in having the median veins straight, and the fork at the hind margin wanting. You will see in Osten Sacken's Catalogue, that the museums do not possess this type for Cecidomyia. I have gone through the literature, and find, till now, that your species is not described."

D. grassator is not a gall-producer like certain Cecidomyians spoken of by Walsh and Riley.

Its larvæ do not extract sap from galls as do those of *C. albovittata*, Walsh.

They do not feed on fungi, like those of *D. coniophago*, Winnertz.

They have not horny hooks at the tip of the abdomen like those of *C. populi*, Duf.

They are not white, like those of *D. caryæ*, O.S.

They do not go under ground to pupate like those of *Lasioptera vitis*, O.S.

The pupa has not two oblique processes from the anal end, like that of the *Lucopis* mentioned by Riley.

The imago has not violet-blue spots, nor are tibiæ and tarsi annulated with black, as in *D. maccus*, Lœw.

It is not brownish-black with white hairs like that of *C. (Diplosis) Pini*, De Geer.

Its thorax is not blackish above with a golden pubescence as in *Lasioptera vitis*, O.S.

I think I may say with all confidence, that my account of the insect, with the notes of Drs. Hagen and Saunders, and the illustrations given afford sufficient specific distinction for the recognition of the insect.

If *D. grassator* had been carried to France with the American vines introduced by the Duchess of Fitzjames, the loss to the Gironde, amounting to $100,000,000, might have been lessened, and the vineyards ultimately saved.

In the next family, the *Pulicidæ*, Packard and others have placed the Fleas. These creatures, though they have no wings, are shown by the form and habits of their larvæ, to be rightly placed. Of their many species *two* are very well known—*Pulex irritans*, Linneus, the Human Flea, and *Ceratopsyllus serraticeps*, Gervais, the Cat and Dog Flea (Fig. 38).

About fifty years ago an ingenious Italian (said to have belonged to a good family in his own land), was employed by Sir Edmund Head, as steward, and afterwards in the same capacity by the Stadacona Club of Quebec. Bertolotto—for that was his name—observing the structure of the flea, its great strength, and its rigid, protective armor, conceived the idea of harnessing the insect, and turning it to account for the amusement of himself and his friends.

And here I would say that I am indebted for most of the information that I can give, respecting Bertolotto and his Fleas, to D. Jewell, Esq., broker, who was intimately acquainted with Bertolotto, Lt. Col. Gray of H. M. Customs, who was a member of the Stadacona Club during the time of Bertolotto's stewardship, and the Rev. E. A. W. King, M.A., Rector of St. Peter's, who witnessed one of Bertolotto's exhibitions in Boston, Mass., at the time of the American Centennial (1876). These gentlemen are all living in Quebec.

Bertolotto broke his fleas of the habit of jumping, by confining them in a glass tube about half an inch in diameter. He fastened a silken tie around the waist of each; by means of this he could attach them to various contrivances. He made a small carriage, fastened fleas inside as passengers, a flea on the box as coachman, and a flea behind as footman or guard. Then fastened fleas to the pole as horses. These soon found that "a long pull, a strong pull, and a pull all together," was the way to advance; and so the equipage moved on, to the delight of the observers. A number of like contrivances made up a show, that from its very novelty, became popular, and consequently remunerative; and Bertolotto travelled to exhibit it.

I have been told that, on a certain occasion, when giving a parlour entertainment, before some exalted personages, Bertolotto discovered, to his dismay, that his leading performer, his best trained flea, which he had named Napoleon, had made its escape. In the warmth of his southern temperament he bewailed his loss—"Oh, my Napoleon! My Napoleon is gone! What shall I do?"

As the escape of Napoleon the Great from Elba occasioned dismay amongst the powers of Europe, so the escape of Napoleon the Little occasioned disturbance in the minds of the ladies present—they anticipated dire attacks.

Presently one of the fair ones hastily left the room. Soon afterwards a maid came in, bearing a plate, and on the plate a glass, and under the glass *a flea*. Bertolotto welcomed it with delight. But telling the story afterwards he said, "Lo and behold, *it was not my Napoleon at all!*"

The Rev. Mr. King thus described the performance he witnessed:—"Bertolotto stood behind a counter, and had a sheet of glass before him. His visitors were seated round the room. Three or four persons came up to the counter at a time. Bertolotto first exhibited a small house, that he called the "Fleas' Hotel"—he had about 50 fleas in it. Then *an uneducated flea*, fastened by a fine gold chain to a small ball, was shown. This flea jumped about wildly. After that a Flea Orchestra was exhibited; about twenty-five fleas, each bearing a minute imitation musical instrument, were placed in a semicircle, and went through the motions of playing upon their instruments, while a musical box gave forth a tune. The Prince of Wales in India was represented; a toy elephant bearing a howdah was set out; fleas represented the prince and his attendants, and a flea was the mahout. A Military Review; the Coach and Horses; a Flea working a windlass that brought up a small bucket, etc., etc., were shown."

Questioned about the feeding of his fleas, Bertolotto said that he fed them only at night; and he showed a red place on his wrist—a token of the *phle*-botomy he had undergone the night before.

When he was asked, "Where do you get your fleas?" he replied, "Not in Massachusetts; the fleas here are too poor—they are no good. *I have to send to Canada for the good ones*!"

Mr. Jewell has given me an original ticket for Bertolotto's show. It reads:—

"Signor Bertolotto's
original exhibition
of the
EDUCATED FLEAS
Now open at 39 *Union Square,*
From 10 a.m. to 6 p.m.
Admission 25c
Programmes in the Exhibition Rooms."

Between the words *original* and *exhibition* there is a small engraving of a flea with a soldier on its back.

The family Simulidæ is an objectionable one.

I lived many years ago in a cottage near a brook, which meandered through a valley, and fell into a neighboring lake. This brook abounded with the pretty little trout, *Salmo fontinalis*.....It also abounded with the larvæ of the Black Fly of the North, *Simulium molestum*, Walker, which are said to be harmful to the young fry of the fish.

The Black Fly itself is a compact insect having a stout proboscis with which it inflicts a more severe wound than that given by the mosquito. I have seen the faces and necks of children running with blood from the bites of this insect.

There is a stately White Willow over-shadowing my yard at Levis, and other trees are near. In the calm summer evenings, when the light has been fading, I have often sat upon my verandah and watched the mazy dance of *Plecia heteroptera*, Say, plainly seen against the western afterglow. This insect is a *black* fly—entirely black; but it is "guileless of offence." It belongs to the family Bibionidæ.

The disreputable family of mosquitoes known as the Culicidæ have been ably set before us by Howard, Smith and other writers. Our common species at Quebec is *Culex consobrinus*, Robineau-Desvoidy.

Drain the land, stock the pond with fish, keep the water-butts closely covered, banish the mosquitoes—"their room is better than their company."

A very interesting family of two-winged flies is that of the Tipulidæ. The typical insect of this is the Tipula, Crane-fly, or Daddy-long-legs.

The finest of our Quebec Tipulidæ is *Tipula flavicans*, Fab. It has an expanse of wings of nearly two and a half inches; and its legs when extended reach over a space of three and a half inches diameter. The wings of this insect are prettily veined and are spotted with brown and white. Its long abdomen is light with dark brown markings.

A very pretty Crane-fly is *T. trivittata*, Say. It has three smoky brown bands crossing the wings, and the wing tips are clouded with the same color.

A very common insect in our woods is *T. cincta*, Lœw. It is very Quaker-like in its coloring, having body, legs and wings of a sober drab.

Smaller and brighter in color is *T. ferruginea*, Fab. Its prevailing color is orange-red.

Pedicia albivitta, Walker, is a larger and handsome Crane-fly. It may be readily distinguished by its brown costa and the obtuse-angled triangle raised upon it. In the male of the species there is a brown line running from the obtuse angle to the hind margin of the wing.

In June, 1896, I took, in the grounds of my friend Mr. Wheeler, at Bergerville, a fine species of *Ctenophora*. Its head and thorax are jet black, polished; its abdomen is black, excepting the two first segments which are

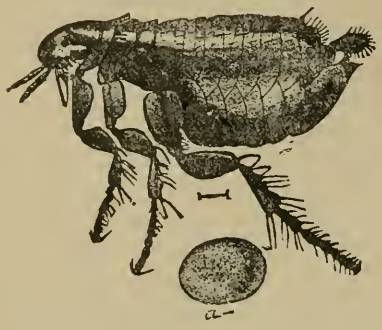

Fig. 38. Cat and Dog Flea, greatly magnified; *a* the egg.

Fig. 39. *Bittacomorpha Clavipes*. (original).

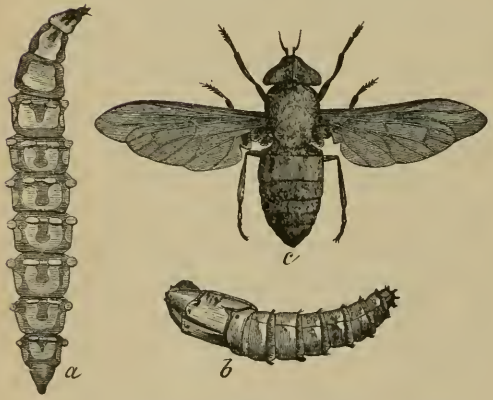

Fig 40. Black Horse Fly; *Tabanus atratus*.

Fig. 41. Robber Fly; *Asilus*.

Fig. 42. *Pterodontia flavipes* (original).

Fig. 43. Syrphus Fly.

Fig. 44. 1. *Odynerus tigres*. 2. *Temnostoma bombilans* (original).

Fig. 45. Tachina Fly, parasite of the Army-worm.

bright red. The legs are red. The wings are somewhat smoky; their veins are dark brown distinctly marked, and there is a brown spot on the costa at about one-third the length of the wing, counting from the tip.

But I think the most remarkable of the near relatives of the Tipulidæ is *Bittacomorpha clavipes*, Fabricius (Fig. 39). This creature has trans-

parent wings, a thin body, and long legs banded with white. When it flies you do not see its wings—it seems to float like a film. It is an insect fairy.

One female Crane-fly will lay about 300 eggs. These are small, black and glossy. They are laid in, or close to, the ground. The grubs that come from them are familiarly known as Leather-jackets. They feed on the roots of grasses, corn, etc., and sometimes do much damage. Unlike other maggots the larva of the Crane-fly has a well-marked head, black and horny, with a pair of strong black jaws; and a pair of small horns. At the blunt extremity of the creature are four tubercles. The grubs turn to pupæ in the ground; and the flies appear towards the end of summer.

Fall ploughing, rotation of crops, lime-dressing for the land, drainage, all help to keep the numbers of the Leather-jackets down.

The perfect flies are quite harmless. They are remarkable for the seeming ease with which they part with their limbs. I find it rather a difficult matter to obtain perfect cabinet specimens of them.

In the Cœnomyiidæ comes the *Cœnomyia pallida* of Say. This fly is figured by Gosse in the *Canadian Naturalist* p. 199. It is believed to be the same as the *C. ferruginea* of Europe. I have four fine specimens in my collection. They were taken in the Eastern Townships, at different times. The fly is fawn-colored throughout, with large blue-black eyes.

The family Stratiomyidæ numbers some fine insects. One of them is quite common at Quebec, viz., *Stratiomyia obesa*, Lœw. It has a yellow face jet black eyes, a black body marked with yellow stripes; its legs are yellow, and its wings are light fawn-colored, darker on the fore part of the wing. It is a handsome fly.

A family of objectionable insects is the Tabanidæ. Amongst them comes that annoying fly, *Chrysops fugax*, Walker, which does its worst to spoil the entomologist's pleasure in the woods and fields, especially when there are cattle near. This fly is black, and has a brown patch in the centre of the wing. There is no mistaking it—its incessant audacious attacks make it known.

Happily we have not in Quebec the formidable *Tabanus atratus*, Fab. (Fig. 40). But the fine fly *Tabanus rufus*, Palisot Beauvois, often made its appearance round my stable when I kept a horse and cows. It is three-quarters of an inch in length of body, and an inch and a half in expanse of wings. Its prevailing color is brick-red.

To the Asilidæ belong the Robber Flies (Fig. 41), which are so named from their habit of pouncing down upon the backs of other insects and destroying them.

I have seen the King Bird alight, with the utmost daring and dexterity, upon the shoulders of the Hen Hawk, and peck at its head to drive it away from the neighborhood in which the little King Birds were gathered. And the Robber Flies do not hesitate to pounce down upon such formidable insects as wasps and bees—not merely to put them to flight, but to drain away their life-juices. Our commonest kind is *Asilus Novæ-Scotiæ*, Macquart.

The Bombylidæ are an interesting family. From their habit of hovering over blossoms, they are called Bee Flies. *Anthrax fulviana*, Say, is quite common at Quebec. Its brown body is covered with a yellow down, and its wings have an irregular brown border along the costa. A less bulky and prettier fly is *Anthrax sinuosa*, Wiedemann. This is dark brown in color, and its wings are of a rich warm brown, but have a clear space along the hind margin. In the genus *Bombylius* we have *fratellus*, Weid., *major*, Linne, and *pygmæus*, Fabricius. The last named is a veritable fairy. Its small brown body is edged with yellow; its wings are richly

spotted with black, and have a brown bar along the costa; and its proboscis extends in a straight line from the head—as is the case also with *fratellus* and *major*.

Of the Leptidæ I have taken *Leptis Boscii*, Macquart, at Quebec; of the Empidæ, *Rhamphomyia umbrosa*, Lœw.; and of the Therevidæ, *Thereva senex*, Walker.

A fly of strange appearance is *Pterodontia flavipes*, Gray (Fig. 42). It is oval in shape and raised, and looks like a large Lady-bird. Its colors are black and red. It comes in the family Cyrtidæ. I have taken a few specimens of this fly at the Gomin Swamp.

The family Syrphidæ contains a number of remarkable flies. Some of them have a strange resemblance to wasps (Fig. 43). One day when seeking in the woods for additions to my collections of the Vespidæ, I saw what I took to be a fine female of *V. arenaria*. I caught it and found that it was a specimen of the Syrphid, *Spilomyia fusca*, Lœw.

Milesia eccentrica, Harris, resembles a yellow wasp, and so in less degree, does *Chrysotoxum derivatum*, Walker.

Temnostoma bombylans is a handsome fly belonging to the Syrphidæ. I do not know its history; but the creature bears so striking a resemblance to *Odynerus tigres*, that I suspect it to be a familiar of that wasp (Fig. 44).

Sericomyia militaris, Walker, is quite common at Quebec. It probably derives its name from the yellow bands on its abdomen, which look like the facings of a soldier's coat.

Spilomyia quadrifasciatus, Say, is a large, handsome fly. Its long, cylindrical abdomen has a conspicuous golden band round the upper part.

The rat-tailed maggots of *Eristalis tenax*, Linneus, thrive in polluted water. The tail is a breathing-tube. The flies of the species may easily be mistaken for drones of the Hive Bees, and are commonly called Drone Flies. Besides this species, *E. transversus*, Wied., and *E. dimidiatus*, Wied., are common at Quebec.

Volucella evecta, Walk., is very common with us. Its Larvæ are found in Bumble Bees' nests.

I have taken three specimens of the pretty fly *Conops furcillatus* upon flower-heads. The larvæ of the Conopidæ are said to be parasitic in the bodies of Bumble Bees.*

In the Œstridæ we find the Bot-flies of the horse, ox, sheep, etc. The Horse Bot-fly, *Gastrophilus equi*, Meigen, lays its eggs on the fore-legs of the horse. The larva, leaving the egg, causes irritation and is licked off by the horse. It is carried in the saliva to the stomach of the animal. There it attaches itself, and from thence on getting its growth, it is voided.

The larvæ of the Ox Bot-fly or "Warble-fly," *Hypoderma bovis*, Fab., cause tumors in the back of the ox, which injure the skin—a grubby hide is of one-third less value than a sound one.

The Sheep Bot-fly, *Œstrus ovis*, Lin., lays living maggots in the nostrils of the sheep. These crawl into the frontal hollows of the sheep's head, and get their growth there.

The family Tachinidæ is a large one, Fig. 45. In it we have *Histricia vivida*, Harris, a showy bustling insect, with a rounded, red abdomen, set with black bristles. It is common and well known.

*"The Conopians undergo their transformations in the bodies of humble bees, their young subsisting on the fat contained within the abdomen of their luckless victims."—Harris, "Insects Injurious to Vegetation," p. 611.

Another fine insect in the same family is *Echinomyia florum*, Walker. It is of a glossy blue-black, with light sienna-colored wings, and has a yellow patch on either side of the first joint of the abdomen.

Gonia capitata, DeGeer, is a prettily banded fly, also in the Tachinidæ. It frequents flower-heads, and was abundant at Quebec two years ago.

A fly of strange habits is *Sarcophaga sarraceniæ*, Riley, Fig. 46, belonging to the family Sarcophagidæ. In the pitchers of the plant, *Sarracenia purpurea*, will be found a decaying mass of insects, which had been attracted by, and drowned in, the liquid that the pitchers contain. Into this corrupting mass the fly, *S. sarraceniæ* drops her eggs. The maggots from these thrive in pollution and, after attaining their growth, bite a way through the side of the pitcher and fall into the surrounding herbage, in which they undergo the pupal change.

The Muscidæ form another large family, Fig. 47. In it we find *Musca domestica*, Linn., *Lucilia Cæsar*, Linn., *Sarcophaga carnaria*, Linn., household pests too well known.

In the Anthomyidæ comes the troublesome *Anthomyia raphani*, Harris, which spoils our radishes.

The ochre-colored Dung-fly, *Scatophaga stercoraria*, Linn., is common. It is a representative of the Cordyluridæ.

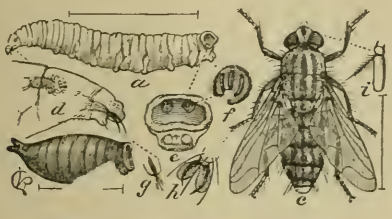

Fig. 46.—Sarcophaga sarraceniæ.

Fig. 47.—A Muscid Fly.

Among the Ortalidæ is found that most remarkable and handsome fly, *Pergata undata*, Wied., which is figured on page 610 of "Insects Injurious to Vegetation" by Harris. I have taken several specimens of this fine fly in the Eastern Townships.

Another beautiful insect belonging to this family is *Chætopsis ænea*, Wied. It has a glossy blue body, and pretty banded wings. I have found its maggots preying upon Lepidopterous larvæ, in the stems of bulrushes, and have raised the perfect insects from them.

Of insects in the family Trypetidæ I have taken at Quebec, *Straussia longipennis*, Wied., *Eutreta sparsa*, Wied., *Eurosta solidaginis*, Fitch, and *Tephritis albiceps*, Lœw.

It is *Eurosta solidaginis* that inhabits the large, round pithy galls that are found on the Golden Rod.

In the Piophilidæ comes the well known *Piophila casei*, Linn., whose larvæ are the "hoppers" found in cheese.

There are some other families of Diptera to which it does not come within my present purpose to refer. I have endeavored to compress within the limits of this article such information as seemed to me likely to arouse an interest in the two winged flies, and to convey ideas of their number, variety and habits. Every species has doubtless its peculiar life-history —known or unknown, to man. Every species fulfils its purpose in the economy of Nature. They all bear testimony to the marvellous resources of the Divine Creator, who *in Wisdom hath made them all.*

SUMMER MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

A summer meeting of the Society was held at the Ontario Agricultural College, Guelph, on Thursday and Friday, July 4 and 5, 1907. Through the kindness of President Creelman the members from a distance were hospitably entertained in the College residence during their visit, the ladies of the party being provided for in the Macdonald Hall. The number in attendance was smaller than anticipated, many who had been looking forward to taking part in the meeting being prevented from coming by a variety of causes. A very satisfactory audience, however, was made up by the Summer School of Ontario teachers from the Macdonald Institute, and several students and members of the College staff. The sessions began on Thursday afternoon in the lecture-room of the Biological Department, the President of the Society, Dr. Fletcher of Ottawa, being in the chair. Mr. H. H. Lyman, of Montreal, read a paper on the distinctions between *Thecla calanus* and *Edwardsii*.

Dr. Brodie, of Toronto, described the life-history of a colony of the Tent Caterpillar and related his experiences in breeding a large number during a series of years in order to observe the effects of parasites upon them.

Dr. Fletcher gave an account of a visit he recently paid to Massachusetts and described what was being done to control the Brown-tail and Gypsy moths by the importation of parasites from Europe and by practical field operations.

Mr. C. W. Nash, of Toronto, spoke on "Balance in Nature," in which he described in a very interesting manner some of the numerous checks and counter-checks which are provided in order to prevent the undue preponderance or the extermination of any particular species, and showed how this balance had been upset by man's disturbing agency and the difficult problems that had arisen in consequence. A discussion followed which was participated in by the chairman, Dr. Brodie, Prof. Bethune, Mr. Jarvis, Mr. Cæsar and others.

In the evening the session was held in the Nature Study Lecture-room of the Macdonald Institute and was attended by the Summer School and a number of others from the town and College as well as by the members of the Society. Dr. Henry Skinner, of Philadelphia, gave a highly interesting lecture on "Insects as Carriers of Diseases." Mr. C. W. Nash followed with a lively address on "Instinct *vs.* Education" and Dr. Fletcher spoke in his usual attractive manner on "Nature Study as a Means of Education." The evening was thoroughly enjoyed by all present and no doubt the school teachers carried away with them much information and many impressions that will be of value to them in the future.

The next day, July 5th, was given up to an excursion to Puslinch Lake, a picturesque sheet of water about nine miles from the College. The Summer School joined in the picnic, making up a party of more than sixty in all. The day was spent in collecting botanical and entomological specimens and other objects of interest. At the close short addresses were given by members of the College staff and others on various specimens that had been brought in, including fresh-water shells, insects, and plants. The meeting on the whole was so delightful and successful an experiment that it will no doubt be repeated in future years and become annually more attractive and well-attended.

ENTOMOLOGICAL RECORD, 1907.

By Dr. James Fletcher and Arthur Gibson, Ottawa.

The season of 1907 in Canada will long be remembered for its unusual and irregular character. The spring, right across the continent from the Atlantic to the Pacific, was cold, dry and late. As a consequence, insects of all kinds were remarkably scarce, and the paucity of insect life in April and May had a direct effect on bird life as well as in many places also upon the fruit crops. Where fruit growers were fortunate enough to have colonies of bees near their grounds there was a conspicuous advantage to the crop from the much larger number of flowers which were fertilized by these useful agents and friends of the fruit grower. The main migration of warblers and other insect-eating birds was much delayed by cool weather and the tardy revival of insect life. The exceptionally backward nature of the season continued throughout the summer and was only in a measure compensated for by the long open autumn without killing frosts. From an entomological point of view, we seem to be passing through a period of "poor years," which began with the year 1901. Notwithstanding this, there has perhaps never been a time when better work has been done in investigating the insect fauna of the country. This is directly due to the far higher appreciation of the value of entomological studies, the greater number of workers and the improved facilities for those studying insects to get into touch with others of similar interests.

The appearance of several elementary works on various branches of the subject, such as the Insect Book, the Butterfly Book and the Moth Book, have acted as a stimulus to direct the attention of students to, and encourage them in the study of entomology. Local Natural History Societies, Horticultural Societies and schools, in all parts of the country, are devoting more time than ever before to the habits of insects, and the observations of their members are being published for the help and encouragement of others. Agricultural journals now include regularly articles upon the insect foes and friends of the farmer. The value of these articles depends entirely upon their scientific accuracy, and there is a constant demand for information on the life histories of insects. Such facts as this information is founded upon, can only be learnt by careful and close personal observation by the trained entomologist. The members of the Entomological Society of Ontario, located in all parts of the Dominion, are collecting assiduously and, in the pages of the *Canadian Entomologist* and of the Annual Reports, are making known their discoveries for the benefit of the whole country.

During the past year, in addition to the constant and important work of many collectors who have not the opportunity to travel from their own home fields of action, several collectors have penetrated to little known fields of work and have brought back many treasures, which in due time will be worked up and reported upon; thus, useful knowledge will be disseminated as to the geographical distribution of species, their life habits, and varying foods in widely separated localities. Of the officers of the Geological Survey Department, Mr. Joseph Keele, collected during the past summer along parts of the Stewart and Pelly Rivers in the far off Yukon. Mr. W. J. Wilson again visited the Hudson Bay slope and was this year along the height of land. Mr. T. P. Reilly, of the Alaska Boundary Survey, and Mr. Douglas H. Nelles, of the same Survey, brought back small collections, the former from near Sixty Mile River, along the 141st meridian in the Yukon, and the latter from Bartlett Bay, off Glacier Bay, Alaska. Mr. Andrew Halkett, Naturalist of the Department of Marine and Fisheries, collected during the last summer

in the Provinces of Saskatchewan, around the Qu'Appelle Lakes, and in Alberta around Beaver Lake, which localities he was visiting to study the local fishes, but found time to collect several interesting insects. Mr. J. B. Wallis, of Winnipeg, collected at Banff, in the Rocky Mountains, and at Peachland, in the Okanagan Valley, B.C., where he made large collections of insects during July and August. Dr. E. M. Walker, of Toronto, spent the summer at the Georgian Bay Biological Station, at Go Home Bay, Ont., where he made interesting observations on aquatic insects. He also took short trips to Nepigon and Fort William, where he made important collections of orthoptera and odonata. In the month of June, Mr. W. D. Kearfott, the well known microlepidopterist, of Montclair, N.J., paid a visit of a few days to Ottawa, where he made large collections at various places in the district. Dr. Henry Skinner, of Philadelphia, also visited Canada and, after addressing our members at the summer meeting in the beginning of July, proceeded with Dr. Fletcher to Nepigon where two days were spent. They then went to Aweme, Man., and had four days collecting with the Messrs. Criddle, after which a long trip was taken in company with Mr. T. N. Willing, along the Canadian Northern Railway; districts visited were, the Goose Lake district west of Saskatoon, Duck Lake, Prince Albert, Kinistino, Radisson, Lloydminster, Edmonton, Calgary, Banff and Laggan. From Laggan Dr. Fletcher went alone to Vancouver Island. Large numbers of insects were collected in all localities mentioned above. Mr. Gibson spent the first three weeks in September at Rostrevor, on Lake Rosseau, Muskoka, and notwithstanding the unfavorable season, collected enough insects to indicate the richness of the locality. Mrs. Nicholl, of Bridgend, South Wales, this year made a third expedition to the Rocky Mountains and British Columbia, for the special purpose of collecting butterflies. In part of her expedition she was accompanied by Mr. F. H. Wolley-Dod, and, on the whole, these trips were very successful. Mr. Dod has kindly provided us with several of Mrs. Nicholl's records in addition to his own, and there is much of the material still to be worked up.

We have again to express our great obligation to the leading specialists in the United States for their constant courtesies in naming material for our Canadian collectors. Dr. Howard, of Washington, with his assistants; Dr. J. B. Smith, of New Brunswick, N.J., Prof. H. F. Wickham, of Iowa City, Mr. W. D. Kearfott, of Montclair, N.J., and Mr. E. P. VanDuzee, of Buffalo, have placed us all under deep obligations to them. Sir George F. Hampson, of the British Museum, has not only sent several copies of his valuable catalogue to those who have contributed specimens to the British Museum, but has also corrected the names of some species which had been standing under wrong names in Canadian collections for some years.

Literature.

Among the many valuable works, reports and separate papers which have dealt with Canadian insects and which have appeared during the past year, special mention may be made of the following:

Busck, August, Revision of the American Moths of the Genus Argyresthia (separate from Proc. U. S. National Museum, Vol. XXXII., pp. 5 to 24, plate IV., V.), Washington, D.C., 1907. In this important pamphlet, Mr. Busck gives a monograph of the American species of these most attractive and beautiful little moths. All the species are figured except three doubtful species which are unknown to the author. Of particular interest to Canadian collectors are *A. conjugella* which is occasionally destructive to apples in British Columbia and *A. thuiella*, which has been noticeably injurious to the

American Arbor-vitæ, or White Cedar, of Eastern Ontario and Western Quebec, for the past three years. With Mr. Busck's excellent paper there should be no trouble in recognizing any species that have been described.

Caudell, Andrew Nelson, The Decticinæ (a group of Orthoptera) of North America, ninety-four figures. (Separate from Proc. U. S. National Museum, Vol. XXXII, pp. 285-410, published May 23, 1907.) An important paper and one which will be of great help to those studying Orthoptera. Mr. Caudell deals in an exhaustive way with a group which has been found very troublesome to students. His opportunities to study a large number of specimens and also of having travelled extensively in the localities where many species occur have given him facilities which few have enjoyed. The figures given are excellent and will be of great assistance to those working at these difficult insects. Several published species have been reduced to synonyms and new genera have been erected, but the work is very thorough and all orthopterists will be grateful to the author for this timely monograph.

Chittenden, F. H., Sc.D., U. S. Department of Agriculture, Insects Injurious to Vegetables. Small 8vo. New York. Orange Judd Co., 262 pp., 163 illustrations. This is a handy little manual treating briefly of the best known insects which attack vegetable crops and giving the remedies usually applied. Preliminary chapters deal with the value of a knowledge of entomology, the classification of insects, practical agriculture and artificial remedies, and apparatus. Not only will this book be of use to gardeners, but it should be a convenient handbook for students and teachers.

Dyar, H. G., Report on the Mosquitoes of the Coast Region of California, with Descriptions of New Species. (Proc. U. S. Nat. Museum, Vol. XXXII, pp. 121-129). Although a paper of only a few pages, this article by Dr. Dyar will be read with much interest by our western dipterists, as it deals with many species which are found in British Columbia and some other parts of Canada. *Anopheles maculipennis* of the West is now *Anopheles occidentalis* D. & K. A majority of the species treated either have been already found in British Columbia or are sure to be discovered as more extensive collections are made. The value of securing the preparatory stages is shown in many instances in the present paper. Anyone having opportunities of rearing the larvæ of mosquitoes should be careful to save the exuviæ and forward them to Dr. Dyar with the specimens for examination, remembering always that a few perfect specimens are of far more value than a large number of broken ones.

Casey, T. L., A Revision of the American Components of the Tenebrionid sub-family Tentyriinæ (Washington Academy of Sciences, Vol. IX, pp. 275-522). October 18, 1907. In this important work Major Casey monographs in a thorough manner and brings up to date all that is known of "that part of the great family Tenebrionidæ, having the abdominal segments unmodified by a coriaceous hind margin and the middle coxæ enclosed externally by the sterna alone, without the intervention of a small piece attached to the coxæ and sometimes separating the sterna, known as the trochantin." This was Leconte and Horn's definition of the subfamily and has been adopted tentatively for the meantime. The author suggests that he may have overstepped the limit of prevailing conservatism in proposing new genera, but the high quality of Major Casey's work during many years has prov d that although it has occasionally been somewhat severely criticised, on account of this very feature, and the great convenience and stability of a large proportion of his differentiations, these are being adopted more and more even by the most conservative. As in the case of his work on Staphylinidæ,* noticed last year, much foreign material has been used in making comparison

with American forms. The advantage of this is shown in many places. We trust that Major Casey may at no very distant date treat the other subfamilies of the Tenebrionidæ in the same thorough manner as he has done in this publication.

Gillette, C. P., Chermes of Colorado Conifers (Proc. Acad. Nat. Sciences, Philadelphia) January, 1907 (separates issued April 2, 1907), pp. 22, plates 11. This article by Prof. Gillette is the most important contribution towards our knowledge of the spruce gall lice which has yet appeared. It is copiously and beautifully illustrated and the different new species described are dealt with in an exhaustive manner. *Chermes Cooleyi* is the name given to the large and handsome gall found in British Columbia upon the Sitcha Spruce, and the gall, as well as the insect in all its stages of development, are figured and described with great detail. This paper will be welcomed by all homopterists who will be glad to have these different species characterized. In the past nearly all the gall making species of Chermes found on spruce have been called *Chermes abietis*.

Hampson, Sir. George F., (Bart.), Catalogue of the Lepidoptera Phalænæ in the British Museum, Vol. VI, Noctuidæ, 1906, pp. 532, plates XCVI to CVII. Sir George Hampson's new volume appeared early in the year and through his kindness and that of the Trustees of the British Museum was presented to several of the members of our Society who had helped by sending good specimens to the British Museum collection. This volume is of particular interest to Canadians from the large proportion of insects belonging to our fauna which are included among the 692 species described. Of the 322 coloured figures given on the plates no less than 141 species have been already taken in Canada or are quite likely to occur within our limits. The range of the present volume is "the Cucullianæ, the third of the fifteen sub-families into which the Noctuidæ are divided. This subfamily is characterized by its trifid neuration of the hind wing combined with spineless tibiæ and smooth eyes surrounded by eyelashes of bristle-like hairs. It forms a group of genera very closely related to the Acronyctinæ, the lowest of the subfamilies of the Noctuidæ Trifinæ." This volume is of great importance to all North American students. From correspondence with Sir George Hampson it is apparent that there are a great many species of North American Noctuidæ, of which good specimens would be most acceptable for the British Museum. It is manifestly to the advantage of everyone to help now by sending specimens to Sir George Hampson, particularly those concerning the identity of which there is any doubt. He will gladly examine and report upon them. It may be noted that Prof. J. B. Smith, who is one of ourselves, is closely in touch with Sir George Hampson and has been of great assistance to him in the volume now referred to.

Kearfott, W. D., New North American Tortricidæ; Transactions of the American Entomological Society, Philadelphia, Vol. XXXIII, No. 1, pp. 1 to 98. (Separate signatures mailed as issued between Feb. 2 and March 27, 1907.) In this article 159 species and 4 varieties are described as new, and of these 20 species are from Canada. This valuable contrib tion will be of great value to Canadian students of microlepidoptera, in whose behalf the author has been so untiring in his efforts. Many hundreds of specimens have been submitted to him from collectors in all parts of the country and he has been most generous in naming and returning authoritatively labelled material. Our Ottawa members not only had the great pleasure of meeting Mr. Kearfott when he paid us a short visit last spring but had the privilege of accompanying him to the field, where they got much valuable information as to the best ways of collecting and rearing microlepidoptera. Mr. Kearfott's enthusiasm was an inspiration.

The following is a list of the names and addresses of collectors heard from during 1907.

Anderson, E. M., Provincial Museum, Victoria, B.C.
Albert, Rev. Roger, Maisonneuve, Que.
Baird, Thomas, High River, Alta.
Baldwin, J. W., 74 Besserer Street, Ottawa.
Bédard, Jos., Ste Croix, Que.
Bethune, Rev. Prof., O. A. C., Guelph.
Boulton, A. R. M., c/o King Brothers, Quebec, Que.
Brodie, Dr. W., Provincial Museum, Toronto.
Bryant, Theo., Ladysmith, B.C.
Bush, A. H., 1105 Ninth Ave., Vancouver, B.C.
Chagnon, Gus., Box 186, Montreal.
Cockle, J. W., Kalso, B.C.
Criddle, Norman, Treesbank, Man.
Dawson, Horace, Hymers, Ont.
Denny, Edward, 200 Mitcheson St., Montreal.
Dent, W. A., Sarnia, Ont.
DeWolfe, L. A., Truro, N.S.
Dod, F. H. Wolley, Millarville, Alta.
Evans, J. D., Trenton, Ont.
Fletcher, James, Experimental Farm, Ottawa.
Fyles, Rev. T. W., Levis, Que.
Gibson, Arthur, Experimental Farm, Ottawa.
Hahn, Paul, 433 Indian Road, Toronto.
Halkett, A., Fisheries Museum, Ottawa.
Hanham, A. W., Duncans, B.C.
Harrington, W. H., P.O. Dept., Ottawa.
Harvey, R. V., Victoria, B.C.
Heath, E. F., Cartwright, Man.
Hudson, A. F., Millarville, Alta.
Jarvis, T. D., O. A. C., Guelph, Ont.
Keele, Jos., Geological Survey, Ottawa.
Keen, Rev. J. H., Metlakatla, B.C.
Létourneau, Jos., Exp. Farm, Ottawa.
Lyman, H. H., 74 McTavish Street, Montreal.
Marmont, L. E., 2553 Second Ave. West, Vancouver, B.C.
McIntosh, W., St. John, N.B.,
Metcalfe, W., 288 Bank Street, Ottawa.
Moore, W. H., Scotch Lake, N.B.
Payne, H. G., Granville Ferry, N.S.
Perrin, Jos., McNab's Island, Halifax, N.S.
Russell, John, Digby, N.S.
Sanson, N.B., Banff, Alta.
Saunders, Henry, 21 Harbord St., Toronto.
Sherman, R. S., 2285 Sixth Ave., Vancouver, B.C.
Simpson, W., Dom'n Observatory, Ottawa.
Taylor, Rev. G. W., Wellington, B.C.
Venables, E. P., Vernon, B.C.
Walker, Dr. E. M., 99 St. George St., Toronto.
Wallis, J. B., Machray School, Winnipeg, Man.
Williams, J. B., 125 College St., Toronto.
Willing, T. N., Regina, Sask.
Wilmot, E. S., Vernon, B. C.

Wilson, W. J., Geological Survey, Ottawa.
Winn, A. F., 132 Springfield Ave., Westmount, Que.
Young, C. H., Geological Survey, Ottawa.
Zavitz, E. J., O.A.C., Guelph.

NOTES OF CAPTURES.

Lepidoptera.

(Arranged according to Dyar's List of North American Lepidoptera, U. S. N. M. Bull. No. 52.).

RHOPALOCERA.

(Dyar's number.)

8. *Papilio daunus*, Bdv. Vernon, B.C., (Venables).
11. *Papilio glaucus*, L., a. *turnus*, L. Dr. Henry Skinner, of Philadelphia, took a perfect specimen of the melanic form named *fletcheri* by Kemp, at White River, Ont., on the Canadian Pacific Railway, where it was flying with scores of the ordinary form, around a damp spot below the platform.
14. *Papilio thoas*, L. Several specimens of this southern butterfly were taken in Ontario during the past season; Trenton, Sept. 21, (Evans); Sarnia, Oct. 9, (Dent); Niagara Glen, Sept. 3, (Williams).
16. *Papilio machaon*, L., a *aliaska*, Scudd. Mouth of Campbell Creek, Pelly River, Yukon, July 8, (Keele).
17. *Papilio bairdii*, Edw., a. *oregonia*, Edw. Peachland, B.C., July 27, (Wallis).
38. *Pontia napi*, L., b. *hulda*. Edw. Pelly River, July 13, (Keele).
42. *Synchloe creusa*, D. & H. Laggan, Mount St. Piran, near timber line, July 17, scarce, (Dod); Banff, (Sanson).
62. *Eurymus meadii*, Edw., a. *elis*, Strk. The commonest Colias on the head waters of the Athabasca River, (Mrs. Nicholl).
75. *Eurymus nastes*, Bdv. Near Taku River, Northern British Columbia, August 8, 1906, (Bryant).
128. *Argynnis eurynome*, Edw. c. *artonis*, Edw. Duck Lake, Sask., July 22, (Fletcher).
143. *Brenthis alberta*, Edw. On mountains near the head waters of the Athabasca and Saskatchewan Rivers, fairly swarming in many places, end of July, (Mrs. Nicholl).
144. *Brenthis astarte*, D. & H. On mountains near the headwaters of the Athabasca and Saskatchewan Rivers, end of July (Mrs. Nicholl). Dr. Henry Skinner tells us that 2 specimens were also taken on Mount Athabasca (altitude 7,200 feet) by Mrs. C. Schaeffer, of Philadelphia.
Charidryas hanhami, Fletcher. Treesbank, Man., July 15, several specimens, (Criddle, Fletcher, Skinner).
169. *Cinclidia harrisii*, Scud. Blackburn, Ont., June 28, July 5, (Young) Go Home, Ont. (Walker).
218. *Aglais milberti*, Godt. Scotch Lake, N.B. This species has been observed here since the beginning of October. It is one of the rarest butterflies in this section. (W. H. Moore).

270. *Erebia disa*, Thun., a. *mancinus*, D. & H. Headwaters of Saskatchewan, end of July, (Mrs. Nicholl).

291. *Œneis chryxus*, D. & H., a. *calais*, Scudd. Go Home Bay, Ont., June 16, (Walker). This interesting insect is very little known. The specimens described by Scudder were collected by Drexel from near Rupert House at the south-eastern extremity of Hudson Bay. It has also been taken at Carbonear, Newf undland. Scudder says "it appears to be confined to the high northern regions of the eastern half of the continent." Its nearest ally is *Œ. chryxus*, a common insect in the main chain of the Rockies.

295. *Œneis norna*, Thun., k. *brucei*, Edw. Banff, Alta., on Sulphur mountain, (Sanson), occuring at from 7,500 to 8,500 feet altitude. Common on all the high mountains at head of Athabasca and Saskatchewan rivers, flying with *beanii*, end of July, (Mrs. Nicholl).

1. *beanii*, Elwes. Banff, on Sulphur mountain at a height of from 7,500 to 8,500 feet. Mount Stephen and Mount Field, B.C., about 7,000 feet, July 7 and 8. I also saw it on a mountain about 12 miles east of Lake Windermere on July 13. About 10 specimens at Mount St. Piran, Laggan, July 16-18, including a female on the summit at about 8,600 feet and another close above Lake Agnes, below timber line, at about 6,800 feet. (Dod.). Summit of Mt. St. Piran, August 4, (Fletcher).

335. *Uranotes melinus* Hbn. Digby, N.S., July 20, (Russell); Peachland, B.C., (Wallis).

383. *Erora læta*, Edw. Meach Lake, Que., June 14, 15, (Young).

409. *Cupido sæpiolus*, Bdv. Female seen ovipositing on the young flower buds of *Hedysarum boreale* at Kinistino, Alta., July 25, (Fletcher).

437. *Rusticus anna*, Edw. Pelly River, below Hoole River, July 5, (Keele).

469. *Pamphila palæmon*, Pallas. Eastman's Springs, Ont., near Ottawa, June 19, several specimens, (Gibson & Young). Only taken once before in the Ottawa district.

488. *Erynnis sassacus*, Harr. Nepigon, July 9, (Fletcher & Skinner); Go Home Bay, Ont., (Walker).

526. *Polites peckius*, Kirby. Banff, July 27, (Sanson).

584. *Epargyreus tityrus*, Fab. Cartwright, Man., June 2, one specimen, a new record for Manitoba, (Heath).

HETEROCERA.

677. *Pholus vitis*, L. McNab's Island, Halifax, N.S., Aug. 29, (Perrin). An immigrant from the South, Mr. Perrin says that his specimen answers well to the figure of *P. fasciatus* as shown on Plate 3 of Holland's Moth Book.

683. *Ampelophaga versicolor*, Harr. Ottawa, August 18, (Baldwin), Montreal, July, specimen taken at Lafontaine Park, collector unknown. record sent by Mr. Winn. The larvæ feed on *Nesæa verticillata* and should be looked for in August.

704. *Sphinx luscitiosa*, Clemens. Tukon River, branch of Megiskan River, July 20, (Wilson).

713. *Sphinx canadensis*, Bdv. Ottawa, July 6, (Baldwin); Quebec, July 3, (Boulton), Montreal, July, (E. C. Barwick).

778. *Basilona imperialis*, Dru. Kingston, Aug. 12, (Klugh). Larva found feeding on red and white pine in Simcoe County, Sept. 15, (Zavitz).

846. *Ecpantheria deflorata*, Fab. Niagara Glen, June 30, (Hahn).

861. *Phragmatobia assimilans*, Wlk., a. *franconica*, Slosson. Montmorency Falls, Que., June 14, and flying in bright sunshine at Lake Beauport, Que., June 23, (Boulton).

869. *Neoarctia yarrowi*, Stretch. Mount Stephen, Field, B.C., July 7, a fresh female at rest on a rock in hot sunshine, alt. 7,000 feet. I took a larva in first moult nearby, and bred a male on July 29, from a full fed larva found on a rock in hot sunshine on the top ridge of Mount Field, on July 8. This was of the ordinary woolly bear type with moderately long hairs, black mixed with dark red. The younger larvæ were less black, and refused all food offered. I also took a half grown larva high up on Mount St. Piran, Laggan, on July 17. All of these specimens were above timber line (Dod.)

874. *Apantesis virgo*, L., a. *citrinaria*, N. & D., Ottawa, Aug. 4, (Baldwin).

958. *Panthea portlandia*, Grt. A female on electric lamp, July 16, Field, B.C., (Dod).

960. *Panthea acronyctoides*, Walker. McNab's Island, Halifax, N.S., (Perrin).

982. *Apatela leporina*, L. Larvæ sent from North Head, N.B., Sept. 26, by Mr. M. R. Tuttle, and from Halifax, N.S., by Mr. C. H. Churchill. This is the first record we have of the species occurring in New Brunswick and Nova Scotia.

999. *Apatela radcliffei*, Harvey. Montreal about end of June, (Denny); Ottawa, mature larva found on apple, Sept. 26, (Létourneau).

1,008. *Apatela funeralis*, Grt. Montreal, June 4 and 21, July 15 and 27, (Denny); Ottawa, June 10, bred from maple, (Young).

1,012. *Apatela vinnula*, Grt. Digby, July 5, Aug. 9, (Russell); Ottawa, (Fletcher).

1,028. *Apatela retardata*, Wlk. St. John's, Que., July 1, (Chagnon); Ottawa, June 12, (Gibson), June 16, (Fletcher); Digby, June 26, (Russell).

1,046. *Apharetra dentata*, Grt. Digby, Aug. 29, (Russell).

1,078. *Hadenella minuscula*, Morr. Digby, Aug. 3, 1906, Sept. 14, 19, 1907, (Russell). In Dr. Smith's list this species appears as *Hadena minuscula*.

1,146. *Hillia algens*, Grt. Hymers, August, (Dawson); Montreal, (Winn).

1,149. *Hadena bridghami*, G. & R., Digby, Aug. 29, Sept. 12, (Russell).

Hadena ferens, Sm. Windermere, B.C., 3 specimens at light, July 11, 12, (Dod). New to British Columbia.

Hadena alberta, Sm. Calgary, a few at light, July 11 to Aug. 18, (Hudson).

Hadena miniota, Sm. Cartwright, one specimen Aug. 22, (Heath).

Hadena enigra, Sm. Calgary, one at light, July 11, (Hudson).

Hadena maida, Dyar. Kalso, Aug. 7 (Cockle); Glacier, B.C., (Mrs. Nicholl, *fide* Hampson, Cat. VI, p. 344).

1,221. *Hadena apamiformis*, Gn. St. Hilaire, Que., July, (Chagnon).

1.252.1. *Hadena semilunata*, Grt. Gleichen, Alta., one on flowers of Western Snowberry, July 22. I have not seen this for years. (Dod.)

1,279. *Hyppa indistincta*, Sm. Laggan, a female at light, July 18. "Agrees with the figure and description. I have the same species from Kalso and consider it distinct from *brunneicrista*." (Dod.).

1,302. *Laphygma frugiperda*, S. & A., and var. a. *obscura*, Riley. Both common at sugar and light throughout September, at Montreal, (Winn & Denny).

1,341. *Oncocnemis atrifasciata*, Morr. Truro, N.S., (DeWolfe).

1,347. *Oncocnemis major*, Grt. Aweme, July 13, (Fletcher).

1,353. *Oncocnemis pudorata*, Sm. Lake Agnes, Laggan, Alta., Hope Pass, B.C., (Mrs. Nicholl, *fide* Hampson, Cat. VI, p. 154).

1,360. *Oncocnemis regina*, Sm. Pile of Bones hill, 6 miles north of Regina, Aug. 10, 1886, (Fletcher). See Hampson, Cat. VI, Pl. XCIX., fig. 15.

1,429. *Semiophora youngii*, Sm. Digby, Aug. 9, (Russell).

1,533. *Rhizagrotis lagena*, Grt. Red Deer River, near Gleichen, a few at sugar, July 23 and 24, (Dod).

1,579. *Paragrotis plagigera*, Morr. Calgary, July 30 and Aug. 24, at light, (Dod and Hudson). Not seen for years. This species is erroneously recorded as *olivalis* in my Calgary list. (Dod.)

1,584. *Paragrotis pugionis*, Sm. Calgary, Sept. 7, (Dod.); Aweme, July 13, (Criddle and Fletcher); Beulah, Man., (Dennis); High River, Alta., (Baird).

1,599. *Paragrotis fumalis*, Grt. Rostrevor, Lake Rosseau, Sept. 3. (Gibson).

1,630. *Paragrotis vulpina*, Sm. Calgary, Sept. 23, (Dod).

1,695. *Paragrotis tristicula*, Morr. Windermere, B.C., July 12, at light, (Dod.) New to B.C.; Truro, N.S., (De Wolfe). A totally unexpected locality for this species. (J. B. S.)

1,725. *Paragrotis infusa*, Sm. Calgary, Sept. 2, (Dod). New to Alberta.

Paragrotis criddlei, Sm. Aweme, Aug. 24, '06, (Criddle).

Paragrotis cocklei, Sm. Kaslo, July 27, '04 (Cockle); Peachland, B.C., July 7, (Wallis).

1,732. *Paragrotis nordica*, Sm. Redvers, Sask., Aug. 3, '06 (A. J. Crocker, through A. F. Winn).

1,775. *Mamestra purpurissata*, Grt. var. *crydina*, Dyar. Windermere, B. C., July 10, one specimen. This agrees with specimens from Kaslo, the type locality. Dr. Smith claims that it is clearly a distinct species. (Jour. N.Y. Ent. Soc. XV, 152, Sept. 1907.) (Dod.)

1,825. *Mamestra goodelli*, Grt. St. Hilaire, Aug. 5, (Chagnon). A northern or mountain species, (J. B. S.).

1,840. *Mamestra sutrina*, Grt. Victoria, Aug. 29, (Anderson); Laggan, B.C., July 16, (Dod). Field, B.C., June 6, (Mrs. Nicholl).

Mamestra artesta, Sm. High River, (Baird).

1,890. *Morrisonia confusa*, Hub. Montreal, June 4, (Denny).

1,905. *Xylomiges tabulata*, Grt. Montreal, 1906, (Denny).

1,998. *Orthodes vecors*, Gn. St. Hilaire, Que., July 10, (Chagnon).

2,111. *Xylina thaxteri*, Grt. Truro, Sept. 18. (De Wolfe).

2,120. *Calocampa cineritia*, Grt. Truro, (De Wolfe); Montreal, (Denny); Ottawa, Oct. 17, (Young).

Cucullia indicta, Sm. Calgary, (Dod, *fide* Hampson, VI., p. 70).

2,138. *Copicucullia antipoda*, Strck. Penticton, B.C., (Mrs. Nicholl, *fide* Hampson, VI. p. 11.).

2,152. *Nonagria oblonga*, Grt. Trenton, June 24, (Evans).

2,165. *Gortyna immanis*, Gn. Ottawa, Sept. 14, (Fletcher); Rostrevor Muskoka, Ont., Sept. 8, (Gibson).

2,167. *Gortyna obliqua*, Harvey. Aweme, Aug. 28, (Criddle).

2,171. *Papaipema cerina*, Grt. Aweme, at light, one splendid specimen, Oct. 1, (Criddle).

2,175. *Papaipema harrisii*, Grt. Hymers, larvæ found in stems of *Heracleum lanatum*, imago 2 Sept., (Dawson); Aweme, reared from same food plant, Aug. 23, (Criddle).

Papaipema pterisii, Bird. Last year we recorded under the name of *Papaipema harrisii*, Grt., var., some Ottawa specimens reared from *Pteris aquilina*. Mr. Bird now informs us that this is not a variety of *harrisii* but a new species which he has described under the above name.

Papaipema ærata, Lyman, (not *P. nelita*, Strck.). Bred again for the fourth time from burdock, in the type locality, Montreal, (Lyman).

Papaipema eupatorii, Lyman. Montreal, one specimen bred from *Eupatorium purpureum*, (Lyman).

2,221. *Orthosia ralla*, Montreal, Aug. 24, (Chagnon).

2,288. *Nycterophæta luna*, Morr. Red Deer River, near Gleichen. Three specimens on thistle heads, July 24-26: two asleep after a rain storm, (Dod); Rudy, Sask., July 19, (Willing).

2,361. *Schinia marginata*, Haw. Ottawa, Aug. 25, (Gibson). A new record for the Ottawa district.

2,389. *Dasyspoudæa lucens*, Morr. Aweme, June 21, (Criddle). This is the first Canadian record of this beautiful little moth, which belongs to the Coloradan fauna.

2,395. *Melanoporphyria immortua*, Grt. Redvers, Sask., June 9, 1906, (A.Y. Crocker); Aweme, Man., June 21, (Criddle).

2,406. *Melicleptria sueta*, Grt. Vernon, (Venables).

2,420. *Heliaca diminutiva*, Grt. Red Deer River, near Gleichen, July 25 and 26, not common, (Dod).

2,423. *Heliaca nexilis*, Morr. Laggan, Mt. St. Piran, at about 7,000 feet, not rare, July 16-18, (Dod). Wilson Pass, near head of Saskatchewan River, July 22, (Mrs. Nicholl); Banff, (Fletcher, Sanson).

2,472. *Polychrysia moneta*, Fab., a. *esmeralda*, Oberthur. Calgary, July 30 and Aug. 13, (Dod).

2,528. *Autographa Sackeni*, Grote. Brazeau Creek, Rockies, Aug. 3, one specimen, (Mrs. Nicholl).

2,477. *Autographa metallica*, Grt. Duncans, B.C., 2 specimens, (Hanham).

2,487. *Autographa rogationis*, Gn. Toronto, May 3, 1897, Ottawa, (Gibson).

2,504. *Autographa v-alba*, Ottol. Kalso, (Cockle). *Teste* Ottolengui.

2,524. *Autographa corrusca*, Strk. Duncans, occasional, on the wing, July, Aug. and Sept., (Hanham).

2,532. *Syngrapha parilis*, Hub. Mt. Saskatchewan (7,500 feet), July 27, rather common (Mrs. Nicholl). This is the species figured by Ottolengui as *parilis* but by Holland as *devergens*, (Dod).

2,535. *Syngrapha devergens*, Hub. Wilcox Pass, Rockies, Alta., July 26, (Mrs. Nicholl *per* Dod).

2,696. *Fruva tortricina*, Zell. Calgary, one at light, July 30, (Dod).

2,769. *Melipotis limbolaris*, Gever. Digby, July 28, (Russell).

2,836. *Catocala luciana*, Hy. Edw. Cartwright, at sugar, Sept., (Heath).

2,846. *Catocala pura*, Hulst. Cartwright, at sugar, Sept. 10, (Heath).

2,893. *Catocala pretiosa*, Lint. Cartwright, Sept. 10, (Heath).

2,953. *Strenoloma lunilinea*, Grt. Granville Ferry, N.S., (Payne). First Canadian record.

2,983. *Ypsia undularis*, Dru., *a. æruginosa*, Gn. Digby, June 6, (Russell).

3,036. *Philometra metonalis*, Wlk. Windermere, B.C., July 10-12, not rare, new to B.C., (Dod).
3,063. *Lomanaltes eductalis*, Wlk. Digby, June 24, (Russell).
3,117. *Notodonta simplaria*, Graef. Aweme, July 4, Aug. 9, (Criddle).
3,140. *Heterocampa biundata*, Wlk. Truro, July 24, (De Wolfe).
3,142. *Heterocampa bilineata*, Pack. Aweme, June 17, (Criddle).
3,145. *Ianassa lignicolor*, Wlk. Quebec, Aug. 15, (Boulton).
3,353. *Eustroma nubilata*, Pack. Digby, N.S., (Russell). A western moth, which I am rather surprised to see from Nova Scotia. (G. W.T.)
3,387. *Hydriomena sordidata*, Fab., c. *quinquefasciata*, Pack. Skagway District, northern B.C., (White-Fraser & Smith).
3,395. *Hydriomena contracta*, Pack. Ottawa, Sept. 10, (Fletcher); Rostrevor, Muskoka, Sept. 15, (Gibson); Digby, Aug. 16, (Russell). [This name should be *H. contractata*, Pack. (G.W.T.)].
3,449. *Petrophora incursata*, Hbn. Field and Emerald Lake, B.C., July 2-7; Laggan, July 18, up to 6,500 feet, (Dod); Crown Mountain, Vancouver, July 9, (Harvey).
Petrophora fossaria, Taylor. Lake Agnes, Laggan, July 18, (Dod).
3,620. *Deilinea borealis*, Hulst. Banff, June 24, a pair, (Mrs. Nicholl).
3,734. *Cymatophora denticulodes*, Hulst. Calgary, one male at light, Aug. 3, (Dod).
3,743. *Anthelia taylorata*, Hulst. Vancouver, May 8, (Harvey).
3,873. *Nacophora quernaria*, S. & A. McNab's Island, Halifax, emerged March 23, (Perrin).
3,878. *Jubarella danbyi*, Hulst. Vancouver, one at light, April 13, (Sherman).
3,933. *Plagodis approximaria*, Dyar. Kalso, May 3, (Cockle).
3,954. *Euchlæna serrata*, Dru. Trenton, July 12, not taken here before, (Evans).
4,000. *Marmarea occidentalis*, Hulst.. Vancouver, July 1, (Harvey); Duncans, B.C., at light, July, a much larger species than *Azelina ancetaria*, flying a week or two earlier, (Hanham).
4,040. *Leucobrephos brephoides*, Wlk. Mentioned in previous records as *middendorfi;* see Dr. Smith's article, Can. Ent. Nov. 1907. Three specimens, Mayo River, Yukon Territory, April 16, 1907, (J. A. Davidson, through Mr. J. Keele). These were of a very dark form similar to two specimens taken by Dr. A. P. Low, on the portage at Grand Falls, Hamilton River, Labrador, May 12, 1894.
4,106. *Tortricidia testacea*, Pack. Duncans, three specimens at light, in July. Not previously reported from Vancouver Island, Hanham).
4,409. *Phlyctænia acutella*, Wlk. Toronto, (Metcalfe); Ottawa, (Young).
4,514. *Pyralis costiferalis*, Wlk. Trenton, one specimen, July 22, (Evans).
4 583. *Crambus myellus*, Hbn. Vernon, (Venables).
4,977. *Pterophorus kellicottii*, Fish. Ottawa, (Young).
Exartema merrickanum, Kearf. Rouville, Que., July 5, (Chagnon); Ottawa, (Young).
5,033. *Olethreutes capreana*, Hbn. Sudbury, (Evans).
Olethreutes wellingtoneana, Kearf. Wellington, B.C., May 19, (Taylor).
Olethreutes removana, Kearf. Aweme, Aug. 16, (Criddle).
Olethreutes provana, Kearf. Wellington, April, (Taylor).
Olethreutes galaxana, Kearf. Vernon, April 13—May 13, (Venables).

Olethreutes glitranana, Kearf. Aweme, June 29, (Criddle); Regina, July 2, (Willing); Winnipeg, (Hanham).
Olethreutes coronana, Kearf. Aweme, July 9, (Criddle); Beulah, Man., Aug. 15, (A. J. Dennis).
Eucosma fuscana, Kearf. Rounthwaite, Man., July, (L. E. Marmont).
Eucosma tomonana, Kearf. Westmount, Que., (Winn).
Eucosma johnsonana, Kearf. Victoria, (Taylor).
Eucosma hohana, Kearf. Mount St. Piran, Alta., Aug. 17, (Dr. W. Barnes).
Eucosma heathiana, Kearf. Cartwright, (Heath).
Eucosma solandriana, Hbn. Montreal, June 22, (Winn); Ottawa, (Young).
Eucosma madderana, Kearf. Rounthwaite, July (Marmont); Regina, (Willing).
Thiodia awemeana, Kearf. Aweme, May 20 to June 29, (Criddle); Beulah, (Dennis).
Thiodia asphodelana, Kearf. Calgary, head of Pine Creek, July 2, (Dod).
5,200. *Thiodia montanana*, Wlsm. Aweme, Aug. 25, (Fletcher).
Thiodia timidella, Clem. Montreal, June 9, (Chagnon).
Proteopteryx marmontana, Kearf. Rounthwaite, June 11, (Marmont); Aweme, July 12-24, (Criddle); Prince Albert, Sask., July 19, (Criddle); Regina, July 15, (Fletcher).
Proteopteryx criddleana, Kearf. Aweme, July 24, Aug. 13, (Criddle); Rounthwaite, July, (Marmont).
Proteoteras torontana, Kearf. Toronto, June 5, (Gibson).
Epinotia watchungana, Kearf. Aylmer, Que., June 8, (Gibson);
Epinotia plumbolineana, Kearf. Wellington, June, (Taylor and Bryant).
Epinotia normanana, Kearf. Aweme, June 27, (Criddle).
Enarmonia prosperana, Kearf. Vernon, (Venables).
Enarmonia vancouverana, Kearf. Wellington, June, (Bryant).
Enarmonia youngana, Kearf. Ottawa, (Young).
Enarmonia cockleana, Kearf. Ottawa, (Young).
Enarmonia saundersana, Kearf. Toronto, May 24, to June 11, (Saunders).
5,276. *Enarmonia americana*, Wlsm. Ottawa, June 11, (Gibson).
5,314. *Acleris nivisellana*, Wlsm. Rostrevor, Muskoka, Sept. 7, (Gibson).
Epagoge lycopodiana, Kearf. Ottawa, (Young).
5,353. *Sparganothis flavibasana*, Fern. Ottawa(larvæ common on cultivated Honeysuckle (*Lonicera Japonica*), June 19, moths emerged July 2 to 6, (Kearfott and Gibson).
Hysterosia tiscana, Kearf. St. Hilaire, July 7, (Winn).
Hysterosia cartwrightiana, Kearf. Cartwright, (Heath).
Carposina ottawana, Kearf. Ottawa, (Young).
Kearfottia albifasciella, Fern. Ottawa, (Young).
5,524. *Choreutis silphiella*, Grt. Vernon, (Venables).
Recurvaria gibsonella, Kearf. Ottawa and Hull, Que., moths emerged June 29 to July 6, (Gibson).
Recurvaria coniferella, Kearf. Ottawa, June 20, (Gibson).
Trichotaphe levisella, Fyles. Levis, Que., (Fyles).
Gelechia fondella, Busck. Aweme, May 30 to June 20, (Criddle); Beulah, (Dennis), Rounthwaite, (Marmont).

5,834. *Stenoma schlœgeri*, Zell. Truro, July 17, (De Wolfe).
5,876. *Depressaria sabulella*, Wlsm. Ottawa, in house, April 16, (Gibson).
5,879. *Depressaria lythrella*, Wlsm. Rostrevor, Muskoka, Sept. 7, (Gibson).
Mompha claudella, Kearf. Rounthwaite, July 11, (Marmont).
6,265. *Lithocolletis ostensackenella*, Fitch. Trenton, May 11, (Evans).
Incurvaria taylorella, Kearf. Wellington, (Taylor).
Monopis monachella, Hbn. Aweme, Aug. 25, (Fletcher); St. Hilaire, July 7, (Winn); Rouville, Que., July 5, (Chagnon).
6,531. *Tinea arcella*, Fab. Montreal, June 21, (Winn).

Coleoptera.

(Arranged according to Henshaw's List of the Coleoptera of America, North of Mexico.)

30*a*. *Cicindela limbata*, Say. Rudy, July 19; Radisson, Sask., July 29, (Fletcher, Willing, Skinner).
35. *Cicindela hirticollis*, Say. Rudy, Sask., July 19, (Fletcher).
35. *Cicindela cinctipennis*, Lec. Running on high dry prairie among the grass, Rudy, July 19, (Willing).
116. *Carabus mœander*, Fisch. Kinloss, Ont., July 16, '98, (per W. Brodie).
188. *Nebria metallica*, Fisch, var. Metlakatla, B.C., (Keen).
645. *Amara fulvipes*, Putz. One specimen from Glen Ross, Hastings Co., May 10, 1902, not previously recorded from Canada, (Evans).
728. *Dicœlus teter*, Bon. North Bruce Co., Ont., (per W. Brodie).
788. *Platynus tenuis*, Lec. Trenton, June, 19, Aug. 11, never taken here before, (Evans).
803. *Platynus ferreus*, Hald. North Bruce Co., (per W. Brodie).
1,057. *Piosoma setosum*, Lec. Rudy, July 20, (Fletcher).
1,477. *Hydaticus stagnalis*, Fab. Ottawa in moss (Dr. H. M. Ami). Mr. Harrington has only twice found the species.
1,487. *Dytiscus circumcinctus*, Ahr. Reference was made in last year's *Entomological Record* to large numbers of this beetle having been taken at electric lights in Winnipeg during the month of October. On Oct. 4 of the present year, Mr. Evans again collected in Winnipeg, over one hundred specimens in the same manner, and about the same time, Mr. T. N. Willing records that enormous numbers of the same species appeared in Regina when his two boys collected for him a pickle jar full and then stopped.
1,791. *Cyrtusa blandissima*, Lec. Aweme, Man., June and July; burrowing in the sand in company with *Ochodœus simplex* and *Bolboceras lazarus*. Found in the burrows made by the larger species, (Criddle).
1,881. *Tychus cognatus*, Lec. Metlakatla, (Keen).
Batrisus zepharinus, Casey. Metlakatla, (Keen).
3,062. *Coccinella tricuspis*, Kirby. Peachland, B.C., (Wallis).
3,095*a*. *Brachyacantha albifrons*, Say. Aweme July 11, (Criddle).
3,148. *Scymnus collaris*, Melsh. Aweme, July 14, (Criddle).
3,734. *Pocadius helvolus*, Er. Reared from a *Lycoperdon*, Grand Forks, B.C., Aug., 1904, (Fletcher).
4,093. *Alaus oculatus*, L. Vernon, July 8, (Wilmot).
4,369. *Limonius subauratus*, Lec. Vancouver, May 4, (Harvey).
4,382. *Pityobius anguinus*, Lec. Granville Ferry, N.S., (Payne).

4,589. *Dicerca pectorosa*, Lec. Kaslo, June 25, (Cockle).

4,594. *Pœcilonota cyanipes*, Say, Radisson, July 29, on *Populus tremuloides* and *P. balsamifera*, common, (Fletcher, Willing, Skinner).

4,600. *Buprestis confluens*, Say. Makinak, Man., (per G. Chagnon); Aweme, July 16, Aug. 9, rare, (Criddle).

4,729. *Agrilus granulatus*, Say. Makinak, Man., (per G. Chagnon).

4,779. *Celetes basalis*, Lec. Aweme, July 5 and 9, rare, (Criddle).

4,913. *Silis spinigera*, Lec. Kaslo, June 2, (Cockle).

5,027. *Malachius thevenetii*, Horn. Kaslo, June 5, (Cockle).

5,110. *Dolichosoma foveicolle*, Kirby. Aweme, July 9, (Criddle).

5,380. *Priacma serrata*, Lec. Kaslo, May 15, (Cockle). Mr. Cockle took a fine pair of this rare beetle at Kaslo. We know of no other Canadian captures. It was described by Dr. J. L. Leconte in 1861 from "East of Fort Colville at Sinyak Water depot and at Camp Kootenay." Dr. Leconte notes the variation in the size of this remarkable species, length .43 to .82 inch.

5,579. *Ochodœus simplex*, Lec. Aweme, burrowing in sand, July 4-13, (Criddle).

5,591. *Bolboceras lazarus*, Fab. Aweme, July 19, (Criddle).

5,594. *Odontœus obesus*, Lec. Aweme, Sept. 2 and 7, in hole in ground, (Criddle); Rudy, July 19, (Henry Skinner).

5,822. *Polyphylla decemlineata*, Say. Rudy, July 19, (Willing).

5,948. *Spondylis upiformis*, Mann. North Bruce County, May 17, '87, (per W. Brodie); Bear Canyon, B.C., May 30, '85, (per W. Brodie); Banff, (Sanson).

5,986. *Gonocallus collaris*, Kirby. Illecillewaet, B.C., May 1, '85, (per W. Brodie).

6,049 *Romaleum simplicicolle*, Hald. Port Sydney, Ont., August, 1890, (Brodie).

6,181. *Xylotrechus quadrimaculatus*, Hald. Ridgeway, Ont., July 28, emerging from branches of Sugar Maple, (Zavitz); Ste. Croix, Que., (Bédard).

6,222. *Desmocerus auripennis* Chev. Glacier, B.C., Aug. 26, (Fletcher).

6,233. *Centrodera decolorata*, Harr. Port Sydney, August, (Brodie).

6,248. *Pachyta liturata*, Kirby. Sulphur Mountain, Banff, Alta., July 30, a black variety, (Sanson).

6,268. *Acmœops vincta*, Lec. Kaslo, May 14, (Cockle).

6,398. *Goes debilis*, Lec. North Bay, June 3, (Brodie).

6,478. *Saperda calcarata*, Say. Peachland, B.C. July, (Wallis).

6,480. *Saperda candida*, Fab. Scotch Lake, N.B., (W.H. Moore); St. John, N.B., (J. Gordon Leavitt). This beetle seems to be very much rarer in the Maritime Provinces than it is in Ontario and Quebec.

6,514. *Tetraopes quinquemaculatus*, Hald. Aweme, July 25, (Criddle).

6,523. *Donacia pubicollis*, Suffr. Qu'Appelle Lakes, July, (Halkett).

6,628*a*. *Cryptocephalus ornatus*, Fab. Aweme, July 10, (Criddle).

6,628*c*. *Cryptocephalus cinctipennis*, Rand. Aweme, July 17, (Criddle).

6,742. *Chrysochus cobaltinus*, Lec. Nelson, B.C., August 19, abundant on *Apocynum androsœmifolium*, (Fitzroy Kelly).

6,781. *Entomoscelis adonidis*, Fab. Near Sixty-one mile River (141 Meridian), Yukon, (T. P. Reilly). The farthest record north we have of the species.

6,795. *Chrysomela exclamationis*, Fab. Aweme, Sept. 6, (Criddle).

6,810. *Chrysomela multipunctata*, Say. This fine species was extremely abundant on willows along the Saskatchewan River at Rudy on July 19, (Fletcher and Willing).

6,827. *Plagiodera oviformis*, Lec. Aweme, June 20, (Criddle).

7,396. *Cœlocnemis dilaticollis*, Mann. Vernon, under logs, June, (Venables); Banff, (Sanson); Peachland, (Wallis).

7,994. *Dendroides canadensis*, Lat. Trenton, June 17 to Aug. 8, five specimens. I have not taken this species for many years, (Evans). Two specimens were brought back from the Skagway District in Northern British Columbia, by G. White-Fraser and R. Smith.

8,134. *Cantharis viridana*, Lec. Rudy, July 20, (Fletcher).

8,271. *Amnesia ursina*, Horn. On raspberries, destructive to the buds, Vernon, B.C., (Venables); Victoria B.C. (Taylor).

8,331. *Evotus naso*, Lec. Rudy, on willows, July 20, (Fletcher); Kelowna, B.C., on apple, (F. J. Watson).

8,427. *Phytonomus punctatus*, Fab. Harrison, B.C., August, (Wilmot). The Clover Leaf Weevil was found on Vancouver Island for the first time in 1902, by Mr. Hanham. Mr. Wilmot's record shows that it has now worked its way up the Fraser valley as far as Harrison.

8,482. *Hypomolyx pineti*, Fab. Skagway District of Northern British Columbia, (White-Fraser and Smith).

8,498. *Lixus concavus*, Say. Ottawa, September, three specimens found on *Polygonum pennsylvanicum*, (Young). This is the Rhubarb Weevil which in some parts of the United States has sometimes given trouble, but is rare in Canada. This is the first time the species has been recorded from the Ottawa District.

8,607. *Otidocephalus chevrolatii*, Horn. Meach Lake, Aug. 1, (Young).

8,676. *Orchestes rufipes*, Lec. This rare little weevil was very abundant and destructive to willows at Ottawa in Sept., the larvæ mining in the leaves and the mature beetles eating out the surface in a similar way to flea-beetles, (Fletcher).

9,667. *Amblopusa brevipes*, Casey, var. Metlakatla, (Keen).

10,767. *Nocheles vestitus*, Casey. Kelowna, injuring buds of Apple, May, 1892, (F. J. Watson).

Nocheles torpidus, Lec. New Denver, B.C., June 14, (W. D. Mitchell); Grand Forks, B.C., June 6, (M. Miller).

Hymenoptera.

Work among the hymenoptera seems to have lagged behind a good deal during the last three years. This is much to be regretted, owing to the great importance of these insects. Moreover, the difficulty in separating the genera and species is sometimes so great that it alone should serve as a stimulus to those who are looking for a specialty in which they may do good work. A few records have been received, which it is well to include here. A collection of *Bombi* has been sent to Mr. H. J. Franklin, of Amherst, Mass., who is making a specialty of these insects, and who has kindly furnished the names of a few of the more interesting which are here given as a beginning. It is to be hoped that these will be largely added to in succeeding years. The wasps and bees present excellent fields for special work.

Zarœa inflata, Nort. Trenton, reared from larvæ feeding upon a shrub in my garden last year; more larvæ were found this year, (Evans).

Labidia opinus, Cress. Kaslo, Aug. 11, (Cockle).

Pamphilius ruficeps, Hargtn. Toronto, July 30, '88, (Metcalfe); Ottawa, May 31, (Harrington); Maisonneuve, near Montreal, Que., (Albert). This handsome sawfly seems to be rare. Another specimen was taken in Montreal some years ago by Rev. C. J. Ouellet.

Oryssus occidentalis, Cress. Peachland, B.C., July, (Wallis).

Diastrophus cuscutæformis, O.S. Guelph, in galls on stems of *Rubus villosus*, (Jarvis).

Diastrophus potentillæ, Bass. Perth, in round galls on stems of *Potentilla canadensis*, (Jarvis). Youghall, N.B., July, (Fletcher).

Diastrophus turgidus, Bass. Guelph, on stems of *Rubus strigosus*, (Jarvis).

Andricus punctatus, Bass. Guelph, on stem of *Quercus coccinea*, (Jarvis).

Andricus seminator, *Harr.* London, Ont., from galls on *Quercus alba*, (J. Dearness).

Andricus topiarius, Ashm. Guelph, leaf galls of *Quercus macrocarpa*, (Jarvis).

Biorhiza forticornis, Walsh. Gravenhurst, Ont., galls on *Quercus alba*, (Jarvis); very abundant on young shoots of *Quercus macrocarpa*, Rivers, Man., (Fletcher).

Pristaulacus melleus, Cress. Kaslo, June 3-30, (Cockle).

Ichneumon caliginosus, Cress. Kaslo, bred from pupa of *Grapta satyrus* found at Montezuma mine, South fork of Kaslo Creek, B.C., emerged Sept. 7, (Fletcher). Mr. Harrington has taken several specimens of this widely distributed species at Ottawa.

Ichneumon milvus, Cress. Ottawa, Aug, 22, (Harrington). Meach Lake, Sept. 1, (Fletcher). One of our rarest ichneumons.

Trogus brullei, Cress. Maisonneuve, near Montreal, (Albert).

Trogus fulvipes, Cress. Kaslo, ex pupa of *Papilio eurymedon*, May, (Cockle); ex pupa of *P. turnus*, Digby, Oct. 2, (Russell); Aweme, July 14, (Fletcher).

Trogus fletcheri, Hargtn. Bred from pupa of *Papilio eurymedon*, Wellington, B.C., (Taylor).

Cryptus proximus, Cress. Kaslo, May, (Cockle).

Ephialtes occidentalis, Cress. Kaslo, July 20, (Cockle).

Ephialtes variatipes, Prov. Kaslo, July 4, (Cockle); Ottawa, (J. A. Guignard).

Rhyssa persuasoria, L. Millie Lake, near height of land, Hudson Bay Slope, July 26, (Wilson).

Thalessa nortoni, Cress. Hymers, (Dawson). Metlakatla, B.C., (Keen).

Lampronota marginata, Prov. Levis, Que., reared from *Trichotaphe levisella*, (Fyles).

Spilochalcis (Chalcis) *encausta*, Cress. Aweme, three specimens of this beautiful and grotesque little insect were taken by Mr. Evelyn Criddle, July 17.

Masaris marginalis, Cress. Kaslo, June 2, (Cockle). This is the first specimen of this genus to be recorded from Canada. It is a slender wasp-like insect but has clubbed antennæ.

Bombus borealis, Kirby. Nepigon, Ont., July 1, '88, Ottawa, Aug. 27, '02, (Fletcher).

Bombus californicus, Smith. Prince Albert, July 6, 1900, an extreme variation; Calgary, July 17, nearly typical, (Fletcher).

Bombus fervidus, Fab. McLeod, Alta., June 20, (Fletcher).

Bombus huntii, Greene. McLeod, June 20, (Fletcher).

Bombus impatiens, Cress. Ottawa, Oct. 2, '02, (Fletcher).

Bombus kirbyellus, Curtis. Fullerton, Hudson Bay, July, 1904, (Halkett); Mount Edith, Banff, July 7, '02, (Fletcher.)
Bombus melanopygus, Mylander. Mount Edith, Banff, July 7, '02, (Fletcher).
Bombus nevadensis, Cress. Vernon, June, (Venables); McLeod, Alta., June 20, '02, (Fletcher and Willing); High River, Alta., a magnificent melanic specimen, the whole body uniformly black, (Baird).
Bombus occidentalis, Greene. Banff. Aug. 28, (Sanson).
Bombus pennsylvanicus, De Geer. Ottawa, (Fletcher).
Bombus perplexus, Meach Lake, July 20, '05, (Gibson).
Bombus sylvicola, Kirby. Fullerton, June 20, '04, (Halkett).
Bombus ternarius, Say. Prince Albert, July 6, '00, (Fletcher).
Bombus terricola, Kirby. Kebinakagami River, near height of land, Hudson Bay slope, Aug. 2, '03, (Wilson).
Bombus vagans, Smith. Nepigon, July 1, '88.; Ottawa, Aug. 25, May 5, (Fletcher).
Psithyrus interruptus, Greene. Mount Edith, Banff, July 7, 02, (Fletcher).
Psithyrus laboriosus, Fab. Ottawa, April 26, 01, (Fletcher).

Hemiptera.

Several additions have been made during the past summer to the collections of Canadian hemiptera, most of them to the sub-order homoptera. Unfortunately, few of the records have been sent in with sufficient data to warrant their inclusion here. Useful notes on these insects, as with all others, give the date of capture, the locality, and, when possible, the nature of the food. The following list from Mr. J. D. Evans, of Trenton, is the most complete and is submitted because many of the insects mentioned are new to the Canadian list. Mr. Van Duzee, who kindly identified the material, considers their capture worthy of being put on record.

Helicoptera septentrionalis, Prov. Sudbury, June 6.
Helicoptera opaca, Say. Co. Hastings.
Heliria strombergi, Godg. Sudbury, Aug. 8, 1889.
Cyrtolobus discoidalis, Emm. Belleville.
Cyrtolobus trilineatus, Say. Belleville.
Telamona Westcotti, Godg. Belleville.
Telamona decorata, Ball. Belleville.
Telamona compacta, Ball. Halifax, N. S., June, 1897.
Scaphoideus lobatus, Van D. Trenton, Sept. 3, '01.
Athysanus osborni, Van D. Trenton, Aug. 15, '01.
Thamnotettix belli, Uhler. Trenton, June 6, '01.
Xestocephalus fulvocapitatus, Van D. Trenton, Aug. 29, '01.
Aphrophora Signoreti, Fitch. Co. Hastings.
Gypona cinera, Uhler. N.W. Terr.
Pediopsis canadensis, Van D. Co. Hastings, June 27, '03.
Bythoscopus sobrius, Walker. Sudbury, 1892.

Mr. T. D. Jarvis, of Guelph, in connection with his studies of vegetable galls and scale insects has found the following species, which are of interest from the localities where found.

Pseudococcus trifolii, Forbes. On roots of white clover at Collingwood.
Chionaspis salicis, L. Guelph, on leatherwood (*Dirca palustris*).

Aspidiotus æsculi, Johnson. On basswood (*Tilia americana*), Toronto, Brantford, Guelph.

Aspidiotus diffinis, Newst. Guilds, Ont., on *Tilia americana*.

Aspidiotus osborni, Newell & Ckll. Toronto, on *Quercus alba;* Guelph, on *Betula lutea*.

Aspidiotus ulmi, Johnson. On *Ulmus americana*, Guelph, Toronto.

Kermes pubescens, Bogue. On *Quercus alba*, Perth, Toronto, Guelph and Brantford.

Aleyrodes asarumis, Schimer. On *Asarum canadense*, Guelph and London.

Aleyrodes forbesi, Ashm. On *Acer saccharinun*, Guelph.

Mr. W. Metcalfe, of Ottawa, sends the following as the most interesting species he has added to his collection this year:

Ceresa constans, Walk. Hull, Que., very local, but abundant on three special basswood trees. A distinct and readily recognized species.

Pediopsis bifasciata, Van Duzee. Mer Bleue, Ottawa, an Aspen Poplar June. A good species distinct from *trimaculata*, Fitch.

Peltonotellus histrionicus, Stal. Mer Bleue, Ottawa, August. The rare macropterous form of this nearly always wingless species.

Clastoptera proteus, Fitch, subsp. *nigra*, Ball. Mer Bleue, Aug. New to the Ottawa district. (Metcalfe.)

Emesa longipes, DeG. Several specimens of this remarkable bug were found by Mr. W. A. Dent, at Sarnia, Ont., in the first week of October. These are the first specimens which we know of as having been found in Canada. It is an extremely slender species with very long slender legs, the anterior pair of which are modified for grasping. They are called Thread-legged Bugs and are predaceous in their habits. Superficially, they resemble minute walkingstick insects but can of course be seen to be different by their mouth parts and from having wings.

Orthoptera.

Large collections of orthoptera have been made in various parts of Canada during the past two years and many interesting species have been taken. The lists are not as yet complete but some of the more interesting have already been reported on. Most of these specimens have been identified through the kindness of Dr. E. M. Walker, who has also himself collected assiduously. His discoveries have been of so much interest that he purposes at an early date to prepare special papers upon them for the *Canadian Entomologist*. The following captures are worthy of mention:

Mecostethus gracilis, Scudd. On swampy prairie, Radisson, Sask., July 29, (Fletcher).

Aulocara elliotii, Thom. Vernon, B.C., July 26, '95 (Fletcher). The first Canadian record.

Arphia teporata, Scudd. Banff, July 12, '02, (Sanson). New to Canada.

Arphia frigida, Scudd. Aweme, June 21, (Criddle); Radisson, July 29; Rudy, Sask. Red-winged, no yellow costal stripe, July 19, (Fletcher.)

Trimerotropis vinculata, Scudd. Ashcroft, B.C., June 5, (Rev. W. M. Roger). Victoria, (Taylor).

Trimerotropis agrestis, McNeill. Aweme, Aug. 14, (Criddle). New to Canada. This elegant little locust has been taken by the Messrs. Criddle on the sand hills near the Douglas swamp, Manitoba, for many years. In coloration it is exactly like the sand upon which it settles.

Melanoplus altitudinum, Scudd. Fort William, Ont., Aug. 27, Nepigon, Aug. 29. One of the females from Nepigon is a long-winged form. (Walker). New to Canada.

Melanoplus extremus, Walk. A few specimens of the short-winged form were taken in a floating cranberry bog at Go Home, Ont., July to August, 1907. It was common at Fort William where both forms were represented, (Walker); Beaver Lake, Alta., Long-winged, (Halkett).

Melanoplus validus, Scudd. Nelson, B.C., Sept. 30, 1906, (Prof. W. J. Alexander). New to Canada.

Amblycorypha oblongifolia, De G. A beautiful specimen of the pink form of this Katydid was exhibited by Dr. Bethune at the annual meeting of the Entomological Society of Ontario. It was collected at Colchester, South, in Essex Co., Ont., Sept. 30. This form is well shown in *Entomological News* for May, 1901. In *Science* for Nov. 8, 1907, is a note on Pink Katydids and other insects by Mr. J. A. Grossbeck.

Anabrus longipes, Caud. Nelson, Sept. 30, 1906, (Prof. Alexander). New to Canada.

Platycleis fletcheri, Caud. "Four males of this rare insect, hitherto only known by the single female from Calgary, were taken at Fort William. This was one of the dimorphic forms I found in this interesting locality and the only one of that nature known among the Decticinæ. The species is interesting as being of a European type; the genus is a common one in Europe, but is the only one of the *Decticinæ* represented in North America," (Walker); Millarville, Alta., Aug., 1906, 2 short winged males (Dod); Mr. Dod's specimens were taken at about 10 miles from where the type specimen was collected. Although recorded as from Calgary the specimen was actually taken between Midnapore and Millarville, and about 10 miles south of Calgary.

Pezotettix borealis, Scudd. Windy Lake, on C.P.R., near Sudbury, Ont., Oct. 4, three specimens on *Comptonia asplenifolia*, (Fletcher).

Asemoplus nudus, E. Walk. Banff, Alta., (Sanson).

Cyphoderris monstrosa, Uhl. Peachland, B.C., (Wallis). The only previous Canadian record for this rare and grotesque insect was Banff, Alta., where a few specimens have been taken by Mr. Sanson. During the past summer Mr. Wallis collected a pair at Peachland on Okanagan Lake, B.C.

Odonata.

Owing to the encouragement given by Dr. E. M. Walker, of Toronto, several of our collectors have sent in specimens of dragonflies, many of which have already been examined by Dr. Walker. He has provided the following list of species which he considers of more than usual interest to Canadian entomologists:

Lestes disjunctus, Selys. Ottawa, (Létourneau). Metlakatla, Aug. 4, '04. Massett, Q.C.I., (Keen).

Lestes inæqualis, Walsh. Go Home Bay, Ont. One pair from cranberry bog on margin of small lake, July 3, (Walker). New to Canada.

Lestes unguicutalus, Hag. Ottawa, July 16, (Gibson, Létourneau).

Argia violacea, Hag. Hull and Meach Lake, Q., July 13, 21, (Gibson).

Ischnura verticalis, Say. Orange form, Hull, Q., July 17, (Létourneau), Pruinose black form, Hull, July 13, (Gibson).
Nehalennia gracilis, Morse. Go Home Bay. Abundant on sphagnum bogs on the margins of small lakes, (Walker). New to Canada.
Enallagma ebrium, Hag. Ottawa, June 7, July 2, (Gibson).
Enallagma calverti, Morse. Laggan, Alta., 1890, (T. E. Bean).
Enallagma cyathigerum, Charp. One male, Pittsburg Camp, Georgian Bay, June 21, (Walker). New to Ontario.
Enallagma minusculum, Morse. Scotch Lake, N.B., July 7, (W. H. Moore). New to Canada.
Gomphus fraternus, Say. Victoria Harbour, Georgian Bay, July, (A. G. Huntsman).
Boyeria grafiana, Williamson. Nagagami River, Hudson Bay slope, 15 miles up, (Wilson).
Boyeria vinosa, Say. Kenogami River, July 16, '04, (Wilson).
Æschna clepsydra, Say. Ottawa, July 8, (Gibson).
Æschna sitchensis, Hag. Levis, (Fyles). Burroughs Bay, Alaska, Aug. 5, 1894, (J. A. Cadenhead). A rare species recorded also from Newfoundland, *Ent. News*, Apl., 1906, p. 135, by Williamson.
Nasiæschna pentacantha, Rambur. One male, Go Home Bay, Ont., July 16. Also one half-grown nymph from the same locality and several full-grown ones from Bala, Ont., Aug. 28, 1906, (W. H. Fraser). New to Canada.
Didymops transversa, Say. Ottawa, July 14, '99, (Gibson).
Neurocordulia yamaskanensis, Prov. Go Home Bay. Nymphs and perfect insects. June 28 to July 23, (Walker). New to Ontario.
Cordulia shurtleffi, Scud. Nepigon, July 1, '88, (Fletcher). Go Home Bay, July, (Walker). Toronto, June 9, (W. J. Fraser).
Tetragoneuria cynosura semiaquea, Burm. Ottawa, May 31, '99, (Gibson).
Somatochlora forcipata, Scud. Rigaud, Que. (Rev. J. E. Desrochers). Also recorded from Newfoundland by Williamson.
Somatochlora minor, Calvert. Fort William, Ont. Aug. 26, (Walker). New to Canada.
Somatochlora albicincta, Burm. Nepigon, Aug. 30, (Walker). New to Ontario.
Nannothemis bella, Uhler. Go Home Bay. Abundant locally, on floating sphagnum bogs, June 28 to Aug. 1, (Walker).
Leucorhinia proxima, Calvert. Peachland, B.C., July 19, (Wallis).
Sympetrum scoticum, Don. Beaver Lake, Alta., Aug., (Halkett).
Sympetrum obtrusum, Hag. Peachland, July 19, (Wallis).
Libellula incesta, Hag. Go Home Bay, July 15, (Walker).
Libellula exusta, Say. Meach Lake, July 21, (Gibson).

Diptera.

(Arranged according to a Catalogue of North American Diptera by J. M. Aldrich. Smithsonian Misc. Coll. XLVI, No. 1,144. The numbers refer to the pages of the catalogue.)

Aëdes quaylei, D. and K. Nanoose Bay, Vancouver Island, B.C., Aug. 1, (Fletcher).
Aëdes spencerí, Theob. Regina, (Willing).
Culiseta inornatus, Will. Carnduff, Sask., (Willing).
138. *Pelorempis americana*, John. Vancouver, B.C., April 22, (Harvey).
153. *Lasioptera corni*, Felt. Guelph, Muskoka and London, (Jarvis).

155. *Dasyneura canadensis*, Felt. Ottawa, reared from the cones of White Spruce, (Fletcher).
Cecidomyia ulmi, Beuten. Guelph, from *Ulmus americana*, (Jarvis).
Hormomyia cratægifolia, Felt. Guelph, on leaves of *Cratægus*, (Jarvis).
169. *Simulium fulvum*, Coq. Lake Louise, Laggan, Aug. 3, (Skinner and Fletcher).
193. *Pangonia fera*, Will. Crown Mountain, Vancouver, B.C., one male, July 9, (R. S. Sherman).
206. *Tabanus phœnops*, O.S. Vancouver, July, a male, (Sherman).
223. *Spogostylum melanopogon*, Big. Crown Mount, Vancouver, July 9, (Harvey). The only locality given in Prof. Aldrich's catalogue is "North America."
241. *Eclimus auratus*, Will. Vancouver, July 25, (Harvey).
272. *Laphria pubescens*, Will. Vancouver, July 25, (Harvey).
401. *Pocota grandis*, Will. Vancouver, July, (Sherman).
418. *Cuterebra frontinella*, Clark. Guelph, larva from neck of kitten, (Jarvis); Almonte, Ont. larva from chipmunk, *Tamias striatus*, (J. K. Darling). The fly emerged at Ottawa in June, (J. F.).
419. *Cuterebra grisea*, Coq. Aweme, (Criddle); Saskatoon, Sask., July 21, (Willing); Norden, Alta., July, (W. Dover).
423. *Alophora magnapennis*, Johnson. One specimen of this grand tachinid was taken at Ottawa by Mr. Harrington. The original type was collected at Montreal by Mr. G. Chagnon. It is easily recognized by its conspicuously large and boldly blotched wings.
449. *Belvosia bifasciata*, Fab. Tessier, Sask. July 20, (Fletcher).
647. *Agromyza æneiventris*, Fallen. Guelph and Muskoka district, on stems of *Populus tremuloides*, (Jarvis).
648. *Agromyza magnicornis*, Loew. Guelph, on leaves of *Iris versicolor*, (Jarvis).

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